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Perceived organizational values and innovation: The role of transactive memory and age diversity in military teams

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ABSTRACT

This study investigates the mediating role of transactive memory system (TMS) in the relationship between perception of innovation value (VIN) and team innovation, as well as the moderating effect of age diversity for the TMS – team innovation relationship. The study of this moderated-mediation model concerning VIN, TMS, and team diversity as a contextual factor, is especially relevant in military teams which are directly concerned by military values, have high needs of effective coordination, and naturally are composed by young soldiers working with older leaders. To test our model, we evaluated 453 employees composing 48 military units from Italy's Air Force. Results confirmed that VIN is positively related to TMS, and that the latter has a positive effect on team innovation except at high levels of age diversity where the effect is reduced and non-significant. These findings highlight the importance of identifying and managing age differences, sharing common and distributed expertise, and promoting innovative initiatives in the military. Theoretical backgrounds, results, limitations, and directions for future research are discussed.

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Perceived values; age diversity; transactive memory; team innovation

What is the public significance of this article?—Our results present two key contributions for military research. First, to enhance innovation, it is important for military managers to promote innovation values that pushes teams to develop transactive memory systems (who knows what) that allow them to innovate. Second, while diversity has normally been considered as a positive antecedent for innovation, we show that age diversity within military teams can be deleterious for team level innovation. Even if diverse teams present potentially more sources of innovation, diverse people can be more divided and less cooperative in diverse teams, and thus reducing their quality of TMS (who knows what) which is deleterious for innovation. This result contributes to advance our knowledge on how to promote team innovation, by both identifying key mechanisms that lead teams to innovate (TMS) as well as critical aspects that need to be properly managed (age diversity).

Introduction

As the military is characterized by having strict chains of command and hierarchical structures (Shamir & Ben-Ari, 2000), military organizations could be perceived as less suitable for innovation. This is a misconception as events like wars have pushed these organizations to develop novel strategies on military defense and war technology (e.g., Parker, 1996). Moreover, a stream of studies has focused on military innovation and address, for example, the societal and political contributors of military power development like the usage of drones (Weiss, 2017) and the constant shift in introducing and managing new technologies. Concerning organizational research, studies on the military are often centered on the advancement and improvement of factors like climate and performance (e.g., Halfhill, Nielsen, Sundstrom, & Weilbaecher, 2005). These are important notions that often come together when addressing teamwork in the military which has been a well-developed topic in this field (see Salas, Bowers, & Cannon-Bowers, 1995). Indeed, military actions are based on teams as tasks are organized at the team-level (Boies & Howell, 2009), ranging from tactical (specific actions in concrete field settings) to strategic actions (that involve monitoring broader operation and large amount of information) (Goodwin, Blacksmith, & Coats, 2018).

This means that, for understanding innovation in military organizations, a focus must be put on their

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teams. We argue that, as innovative initiatives are dependent on teamwork (Salas, Shuffler, Thayer, Bedwell, & Lazzara, 2015), research on teams should be particularly useful for improving innovation in the military. Research on innovation within teams, or team innovation, has received little research attention compared to individual-level creativity, however, a review of the literature has concluded that the field is currently maturing in good shape thanks to its complementary perspectives and the possibility for well-grounded integrations (van Knippenberg, 2017). Concerning innovation, we understand it as a process comprised by two stages: the first one refers to the generation of creative ideas and the second one to their implementation (Anderson, Potočnik, & Zhou, 2014). The study of teams in organizational research has often supported the idea that innovation, at the team-level, can be improved or harmed depending on how team members elaborate, share, and use information (see Hülsheger, Anderson, & Salgado, 2009). This is particularly enhanced by their motivation toward processing information and by how the team members shape and store shared and differentiated understandings (DeChurch & Mesmer-Magnus, 2010; Kozlowski & Ilgen, 2006). Research on team innovation has found that team climate for innovation, transformational leadership (a leader that is targeted at innovation by influencing, inspiring and intellectually stimulating followers trough individualized consideration, Bass, 1985), and team reflexivity (the extent to which team members collectively reflect upon their working methods and adapt as a consequence, Schippers, West, & Dawson, 2015), among others, are team-level antecedents of innovation (e.g., Anderson & West, 1996; Eisenbeiß & Boerner, 2010; Schippers et al., 2015, respectively).

In this article, we propose that the perceived values held by an organization concerning innovation will shape how teams react as a collective in pursue of new ideas to create and implement. In this manner, teams will share their expertise, engage in knowledge sharing and coordinate their efforts building a shared system capable of encouraging innovations. Moreover, we suggest that TMS, a collective cognitive structure that refers to shared and differentiated knowledge from different aspects of a team, could potentially increase team innovation by reducing overlaps in knowledge, clarifying expertise, and offering more time for idea testing; the TMS-innovation relationship has already been explored by some publications (Fan et al., 2016; Peltokorpi & Hasu, 2014, 2016). Finally, team age diversity, or the variety of members from different age groups within a team, may disrupt this relationship in military teams that are already effective due to their developed TMS. The focus on these relationships provides a better understanding on the effects of perceptions in the military, as well as a thorough examination of how important it is to consider age diversity when studying innovation in military teams. We consider that advancing our understating on these teamwork related topics is critical for military organizations, as several critical incidents and failures have been related to intrateam and interteam processes (Mathieu, 2012), and one of the key research line outlined for future research (in military research) is precisely how team composition (including thus diversity) can influences processes and the generation of new innovative strategies and ideas (Goodwin et al., 2018).

Theoretical background

The literature on innovation has explored different ways in which perceived organizational values promote innovative capabilities and facilitate new technology implementation. According to various authors, perceptions of organizational psychosocial factors like climate shape how employees behave due to perceived support, value identification or value-fit (e.g., Ahammad, Tarba, Liu, & Glaister, 2016; Liden, Wayne, Liao, & Meuser, 2014). Perceived organizational values are determined by what employees believe is important to their organization. These values can be ideas regarding standards of behavior as well as the type of goals that employees should follow and attain (Schein, 2010); for example, employees that perceive that their organization adopts a value of 'quality" will be more focused on detail than those that perceived a value of "quantity." Although organizational perceived values are often related to company and employee results, few studies have analyzed their relationship with team-level creativity and innovation.

Perceived values, TMS, and innovation

TMS describes a knowledge repository of the compound knowledge possessed by individual members about who-knows-what within the team (TMS structure) and the mechanisms that the team uses for operating this transactive knowledge (TMS processes) (Lewis & Herndon, 2011; Wegner, Giuliano, & Hertel, 1985). The TMS structure specifies the presence of knowledge within a team implying a differentiated memory structure that stores job-related information like, for example, who's and expert in math or in what specific manner is better to work with this team member. On the other hand, TMS processes are performed by the team to use or update the current knowledge retained; they can be

studied in terms of behavioral indicators which are: specialization which refers to memory differentiation, when each member has specialized knowledge, credibility or the reliability on the knowledge of other team members, and coordination or working smoothly as a result of this transactive knowledge (Lewis, 2003). Finally, TMS has been an important concept of team research studies as it has been positively related to team performance, satisfaction, learning, and reflexivity (e.g., Michinov, Olivier-Chiron, Rusch, & Chiron, 2008; Zhang, Hempel, Han, & Tjosvold, 2007). To understand the practical value of TMS, in a military multidisciplinary team with a high quality TMS, each team member is aware of who knows what and this information is widely accessible and under constant update. This can be really helpful in a situation where, for example, a dynamic task suddenly requires the use of a specific technology; if one team-member is an expert on it, in the presence of a high quality TMS, everybody knows who can take the lead of this part of the task, avoiding unnecessary time consumption or inadequate decisions on the task attribution. This requires that a) everybody knows who the expert is; b) everybody relies on the knowledge of the expert; c) the team is able to coordinate according to this information.

A high quality TMS is not only valuable in dynamic task. We argue that an eagerness to innovate due to VIN will promote information sharing and shared experiences; as team members need to have information on team functioning specificities in order to innovate, members will communicate and discuss about the task leading to a more accurate TMS (Hollingshead & Brandon, 2003). Moreover, the improvement or change of a work element needs to take into account current teamwork and taskwork which are also related to team shared experiences and familiarity – these are antecedents of TMS content (e.g., Gino, Argote, Miron-Spektor, & Todorova, 2010; Ren & Argote, 2011). For example, for enhancing a rescue operation, military units must already know what the current state and tactics for rescue is, and what possible inefficiencies or contingencies this operation has. Later, a collective innovative idea tackling these elements may emerge, be understood, accepted, and then implemented into the work environment. Due to these considerations, we propose that team members that perceive that their organization values innovation will have more reason to share their expertise, as well as be aware of who-knows-what and of what is necessary to accomplish the task, compared to members of a team that doesn't. In other words, VIN may facilitate the development and manifestation of TMS.

Hypothesis 1: VIN has a positive relationship with TMS.

While Lewis (2003) had already discussed the relationship between TMS and the use of task-related information in teams, the empirical support for an explicit relationship between TMS and team innovation is still scarce. Some studies have unraveled a positive relationship with team innovation upon certain conditions. For example, Peltokorpi and Hasu (2016) examined how task orientation affected team innovation in a technological research organization, and TMS partially mediated this relationship. Adding to this, Fan et al. (2016) found that TMS had a positive relationship with team innovation and individual innovative work behavior. They argued that the way that TMS affects team innovation has received little research attention. More recently, Zhang and Kwan (2018) found that TMS mediated the relationship between team learning goal orientation and innovation, and that the effect of goal orientation on TMS was strengthened by task interdependence.

Moreover, the study of Gino et al. (2010) assessed how prior experiences affect team creativity while testing the mediating role of TMS for this relationship. Their results showed a mediating role of TMS, the authors argue that TMS reduces redundant overlaps in knowledge, shared by team members, and clarifies the specialization of knowledge which leads to more efficient cognitive processing. This improved process results in higher creativity as members don't waste cognitive resources on activities that other members are assigned (coordination). Based on these assumptions, Gino and colleagues also argued that developed trust of other members' expertise, could lead to trust on team members' ideas. Furthermore, the link between TMS and innovation can further be explained as specialized knowledge helps teams identify and retrieve diverse resources, and actualize innovative tasks. Wegner (1986) suggested that task knowledge discussions could help teams – he referred to "close relationships" – produce creative outputs which may be the case when team members develop credibility in each other's expertise. Trust in other team members' knowledge will reduce uncertainty, prevent team members from wasting time searching for valuable information, and possibly lead to trust on other members' ideas. Finally, quality exchanges of information, smooth work due to effective coordination, and knowledge retrieval capacities will offer extra time for implementing creative ideas into the workplace.

Hypothesis 2: TMS has a positive relationship with team innovation.

In accordance with these ideas, perceiving that the organization values innovation will only promote innovative behaviors when team members share information and overcome idea implementation barriers. These conditions can only take place when TMS offers members available resources about the task and about the expertise of other members. Moreover, TMS offers time to test new ideas, structures team member expertise and task specificities for problem-solving, and facilitates trust in others' ideas. We argue that when teams perceive that their organization values innovation, team members will share their expertise and develop a well-structured TMS in order to innovate.

Hypothesis 3: TMS will mediate the relationship between VIN and team innovation.

The moderating role of age diversity

Diversity can be studied as variety which refers to categorical differences between team members (Harrison & Klein, 2007). For example, at low levels of professional variety a team will be composed only by engineers, and at high levels of variety each member will have a different profession (a single engineer, a single psychologist, a single psychiatrist, etc.). Researchers that study diversity in terms of variety often focus on, for example, expertise and educational background which are related to the distributed knowledge and a richness of available information. We've decided to study diversity as variety as diverse knowledge and member expertise, related to effective decision-making and coordination, are highly relevant for military teams (e.g., Yammarino, Mumford, Connelly, & Dionne, 2010). Adding to this, the innovation process may be favored or harmed by conditions of diverse perspectives and ideas which are based on categorical differences among team members (Harrison & Klein, 2007).

According to the most recent reviews on team diversity, research should consider the mediators and moderators within the models that study diversity (Guillaume, Dawson, OtayeEbede, Woods, & West, 2017; van Knippenberg & Mell, 2016). Our study on diversity is not interested on the mediators or moderators of diversity but on the role of team diversity as a moderator itself. A few numbers of studies have recently investigated team diversity in this way (e.g., Lee & Chae, 2017; Mitchell, Boyle, Nicolas, Maitland, & Zhao, 2016) but arguments are not lacking. For our case, we argue that team diversity can moderate the relationship between TMS and team innovation. Our interest resides on how team diversity can be a contextual factor that allows or disrupts the effect of team states on team outcomes. Some situations are particularly more appropriate than others for stimulating the practical use of cognitive resources (Barnes et al., 2008), and some can even decrease the likelihood that individuals willingly share their ideas or provide alternative solutions to established problems.

Within military organizations, it's common to find teams with high levels of age diversity where age is correlated to the level of authority and where older employees usually command young soldiers. We argue that age variety can be deleterious to the relationship between TMS and team innovation. First, individuals use easily identifiable attributes for generating a positive affect toward others that have the same characteristics as them and a negative affect toward others that don't (e.g., Hogg & Hains, 1996; Hogg & Turner, 1985). Salient attributes can be detrimental, especially in small military teams where trust is an important component of performance affected by categorization and common group member processes (Adams & Webb, 2002). Second, we argue that changing already established procedures that are highly coordinated may be a particularly difficult subject to discuss as some members (e.g., older members with a higher hierarchical level) may be engaged toward particular methods or operations that have worked in the past and that may still work somewhat effectively. In teams with high levels of age variety, members willing to share new ways of working may withhold their ideas in order to avoid being disrespectful to their superiors or be perceived as rebellious. Based on this, we argue that high levels of age diversity will facilitate misunderstandings and present a disconnection between members of military teams; this, and due to a fear of disrupting efficient work or having trouble explaining and implementing a new idea to dissimilar age members, will hinder idea sharing and implementation in highly coordinated teams (TMS).

Hypothesis 4: Age diversity will moderate the relationship between TMS and team innovation. At higher levels of age diversity, the relationship will be weaker, and at lower levels the relationship will be stronger.

Method

Procedure and participants

Adopting a correlational research design, data were collected from Italy's air force; the aerial defense force of the Italian republic which possess approximately 43,000 employees. We administered a self-report questionnaire

via a secured platform. All participants received a message inviting them to answer the questionnaire with additional description of our research objectives and its confidentiality (anonymous responses). Moreover, measures were translated from English into Italian through a standard back-translation procedure; the innovative behavior measure was already used in previous studies (e.g., Battistelli, Montani, Odoardi, Vandenberghe, & Picci, 2014). Our sample comprised 453 employees composing 48 military teams (3 to 20 members each) being the mean team size 9.44 (SD = 5.54). The larger part of employees was male (97.4%), first class marshals (33.8%) or first marshals (27.6%), 46 to 50 years old (33.3%), high school grads (62.3%), and have worked during 26 to 32 years in the air force (40.4%). Team leaders were male (93.8%), captains (29.2%), 41 to 45 years old (25.0%), high school grads (41.7%), and have worked during 26 to 32 years (25.0%) in the air force. The leaders had additional authority for decision-making but worked within the team as members themselves. Concerning the organization, the air force centers on multiple operational activities and initiatives that include aircraft rescue and search-and-rescue missions. Moreover, the air force implements training activities that address tactical leadership, international and national polygons, personnel recovery, and interoperability cooperation, among others.

Measures

Perceived organizational value of innovation

The variable VIN was measured through 5 items where we asked team members the importance that the Air force attributed to particular orientations corresponding to flexibility, information sharing, cooperation, and initiative. We elaborated this scale using McDonald and Gandz (1991, 1992) taxonomy of values where one of their proposed classifications concerned aspects related to change and mainly the propositions of Finegan (2000) on the organizational value factor of vision. We used a 5-point Likert scale going from "not at all important" (1) to "totally" (5), where a sample item is: For the Air Force it's important to … "Develop and experiment with new ways of solving a problem." Cronbach's alpha is .89.

TMS

TMS was measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) through a 17-item scale (five items for specialization, five for credibility and seven for coordination) developed by Lewis (2003). A sample item is: "I was confident relying on the information that other team members brought to the discussion" (credibility). Cronbach's alpha for this measure is .86.

Supervisor rating of team innovation

Team innovation was evaluated by the team leaders to reduce the probability of common method bias. We used a 6 item Likert-scale going from 1 (never) to 5 (always) taken from Janssen (2000) and modifying it to refer to the team. There were three items for idea generation and three for idea implementation, for example: "My team generates new ideas for difficult issues" (idea generation), and "My team introduces innovative ideas into the work environment in a systematic way" (idea implementation). Cronbach's alpha for innovation is .93.

Team diversity

For the moderating variable team diversity, age differences were measured as variety (Harrison & Klein, 2007) using Blau's index of heterogeneity (Blau, 1977), which goes from no variety with a score of 0 to total variety with a score of 1. This index has the following computational formula: $1 - \Sigma pK2$, p referring to the proportion of members in a category or K. Age variety was measured by asking each team member their corresponding age group among the following possibilities: less than 26 years old, from 26 to 30 (26–30), 31–35, 36–40, 41–45, 46–50, 51–55, and more than 56 years old (8 categories in total).

Control variables

We controlled for team challenging assignments and support for innovation due to their relationship with team innovation. The former refers to new nonroutine activities, that challenge employee's abilities, and that give enough autonomy and high amounts of responsibility to accomplish the task (Preenen, Van Vianen, & De Pater, 2014). We evaluated the team leaders' perception about the extent to which the activities that he or she established where challenging. For this, we used 4 items, with a 5-point Likert scale going from "not at all" (1) to "completely" (5), based on the scale developed by Preenen, De Pater, Van Vianen, and Keijzer (2011). One sample item is "I entrust my team with tasks that require high levels of responsibility." Cronbach's alpha for this measure was .85. Finally, job challenges have been related to innovative behaviors as they, for example, facilitate implicit motivation which is crucial for creativity (Amabile, 1988). On the other hand, support for innovation refers to the perceived practical aid for introducing new ideas into the workplace (Anderson & West, 1996). We evaluated team members using a 5-point Likert scale going from "not at all" (1) to "completely" (5), where a sample item is "I share the goals set for my team." Cronbach's alpha is .91. Support for innovation is a classic predictor of

Table 1. Means, standard deviations, and correlations.

Variables		*M*	*SD*	1	2	3	4	5	6
1	VIN	3.68	0.25	(.89)					
2	TMS	3.71	0.22	.63**	(.86)				
3	Age diversity	0.63	0.17	−0.02	−0.05	-			
4	Team innovation	3.14	0.93	0.14	0.19	−0.20	(.93)		
5	Support for innovation	3.45	0.33	0.19	.31*	.36*	0.25	(.91)	
6	Challenging assignments	3.69	0.88	−0.19	−0.19	−0.17	.63**	0.01	(.85)

Cronbach's alphas are shown in the intersections and between parentheses. N = 48 for VIN, TMS, age diversity, and support for innovation. N = 43 for team innovation and challenging assignments. *M* = Mean, *SD* = Standard deviation. *$p < .05$ (two-tailed); **$p < .01$ (two-tailed).

innovation in teams since its development (Anderson & West, 1996; van Knippenberg, 2017). Perceiving support for innovation is related to having important resources available for innovating like time to test new procedures, cooperation, and support for implementing new ideas into the workplace.

Data aggregation and model factor comparison

As our hypothesis testing involved the team-level of analysis we calculated the rwg(j), ICC (1), and ICC (2) to justify for data aggregation (see Bliese, 2000; James, Demaree, & Wolf, 1984; McGraw & Wong, 1996). The following scores correspond to the rwg(j), ICC (1), and ICC (2) of the aggregated variables: TMS = .74, .85, .98; VIN = .73, .87, .99; and support for innovation = .73, .91, .99. All scores for rwg(j) were above .70 (Bliese, 2000; Bliese, Maltarich, & Hendricks, 2018), above .12 for ICC (1), and above .60 for ICC (2) (James, 1982; Glick, 1985, respectively) so data aggregation was justified.

Results

We present descriptive statistics and correlations in Table 1. As expected, we found a positive and significant correlation between VIN and TMS. However, TMS and innovation were not significantly correlated; we decided to continue to test our model as this last relationship is hypothesized to be moderated by age diversity.

Prior to the hypotheses testing, we carried out a confirmatory factor analysis (CFA) to test the discriminant validity of our measures using MPLUS version 7.4 (Muthen & Muthen, 2015). Results of this procedure showed that our hypothesized 3-factor model showed a better fit for the data, χ^2 (206, N = 452) = 673.21; RMSEA = .07; CFI = .90, compared to the alternative models with fewer factors (see Table 2).

We used again MPLUS for testing the model fit of each variable in our model. Results of this analysis showed satisfactory model fits: for VIN the fit was χ^2 (4, N = 452) = 5.62; RMSEA = .03; CFI = .99, at one factor, which was also the case for team innovation at χ^2 (8, N = 43) = 8.44; RMSEA = .03; CFI =.99. Concerning TMS five items were deleted during this procedure: item 1 for specialization, items 4 and 5 for credibility, and item 6 for coordination due to low loadings. We decided to fix the credibility continuous variable residual variance to zero due to a low negative and non-significant inter-correlation to TMS. Additionally, two items of coordination (items 3 and 4) were inter-correlated due to their resemblance; this further corrected the fit of the scale. After these procedures, results showed a satisfactory model-fit for TMS: χ^2 (62, N = 453) = 206.85; RMSEA =.07; CFI = .92.

We used PROCESS for SPSS (Hayes, 2013) model 14 for testing the moderated mediation model hypotheses. Carrying out the regression analysis produced an index of moderated mediation which was significant: −4.45 (−10.67 to −.37); results are shown in Table 3. We observe that, for the first part of the mediation (r = .65, r^2 = .42, *F* = 9.52, df1 = 3, df2 = 39, $p < .001$), VIN was positively related to TMS at B = .54, SE = .12, $p = <.001$ which confirms our first hypothesis. However, concerning the second part of the mediation (r = .78, r^2 = .61, *F* = 9.51, df1 = 6, df2 = 36, $p < .001$), the analysis didn't identify an effect of TMS on team innovation at B = 1.09, SE = .60, $p = .077$, as the effect was close but not significant, rejecting hypothesis 2. Furthermore, the mediating role of TMS however, was identified at low values of age diversity. The interaction effect was

Table 2. Fit indices for confirmatory factor analyses.

Model	χ^2	df	$\Delta\chi^2$	RMSEA	CFI	TLI	SRMR
Hypothesized 3-factor model	673.217*	206	1312.815*	.071	.900	.887	.053
Two-factor models (Combining TCSI and VIN)	1388.935*	208	597.097*	.112	.746	.718	.086
(Combining TCSI and TMS)	1328.067*	208	657.965*	.109	.759	.733	.079
(Combining TMS and VIN)	1347.213*	208	638.819*	.110	.755	.728	.079
One-factor model	1986.032*	209		.137	.618	.578	.098

N = 453; *$p < .01$; TCSI = Support for innovation. No supervisor-rated variables as data for *n* supervisors is <50.

Table 3. Moderated mediation model regression analysis results.

Variables		B	SE B	*p*
TMS as dependent variable				
Intercept		−2.22**	.49	<.001
VIN		.54**	.12	<.001
Challenging assignments		−.02	.03	.522
Support for innovation		.09	.08	.290
Team innovation as dependent variable				
Intercept		−.91	2.35	.701
TMS		1.09	.60	.077
VIN		−.22	.58	.701
Age diversity		−.64	.60	.292
Interaction (Moderator)		−8.18*	3.19	.014
Challenging assignments		.66**	.11	<.001
Support for innovation		.70*	.33	.042
Conditional effects				
Levels of age diversity	VIN on team innovation through TMS	B/SE	*LLCI*	*ULCI*
Low −.1759	1.38*	.75	.28	3.00
Medium .0000	2.57	.36	−.00	1.38
High .1759	1.94	.45	−.97	.82

N = 48 teams, N = 43 leader scores for team innovation and challenging assignments.
*$p < .05$; **$p < .001$.

negative and significant at B = −8.18, SE = 3.19, $p = .014$; where low levels of diversity showed an indirect effect of VIN on team innovation at B = 1.38, SE = .75, LLCI = .28, ULCI = 3.00; however, at medium and higher levels the effect was reduced and was not significant.

Due to these results, we performed a simple moderation model (labeled by PROCESS as model 1) to specify the direct effect of TMS on team innovation and elaborate Figure 1. Results were similar to the moderated mediation model and are presented on Table 4. The model was overall significant at r = .78, $r^2 = .61$, $F = 11.65$, df1 = 5, df2 = 37, $p < .001$, where the r^2 increase was .07, $F = 7.10$, df1 = 1, df2 = 37, $p = .011$. Results show that TMS was borderline related to team innovation at B = .95, SE = .47, $p = .051$, the interaction effect was also negative and significant at B = −7.67, SE = 2.88, $p = .011$, and the effect of TMS on team innovation was significant at low levels of age diversity at B = 2.15, SE = .71, $p = .001$. This effect was reduced at medium levels of age diversity ($p = .051$) and not significant at higher levels ($p = .582$). This indicates that TMS is related to team innovation, and mediates the relationship between VIN

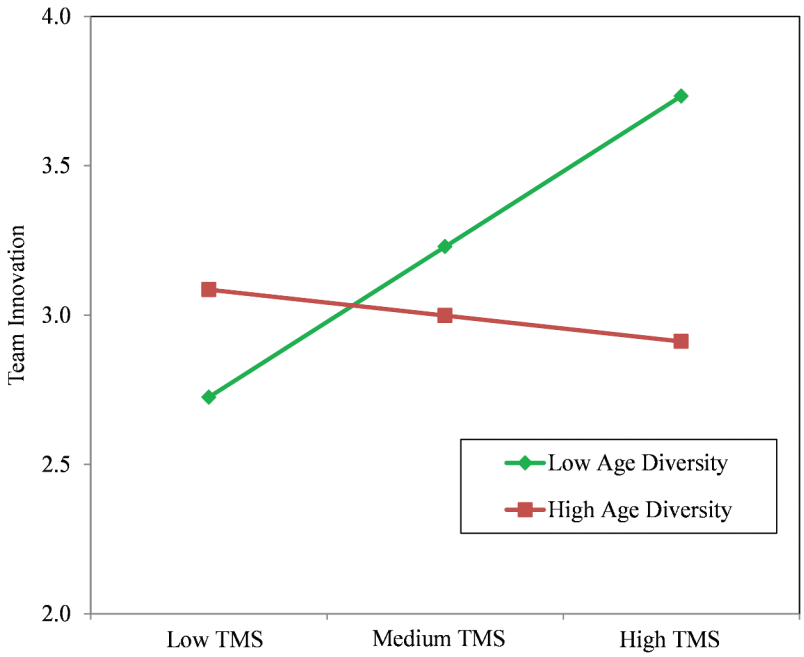

Figure 1. Moderating effect of age diversity on the relationship between TMS and team innovation.

Table 4. Regression analysis results – moderation segment.

Variables	B	SE	*p*
Team innovation as dependent variable			
Intercept	−1.70	1.13	.143
Age diversity	−.65	.60	.280
TMS	.95*	.47	.051
Interaction (Moderator)	−7.67*	2.88	.011
Challenging assignments	.67**	.11	<.001
Support for innovation	.68*	.32	.042
Conditional effects			
Levels of age diversity	Effect of TMS on team innovation	SE	*p*
Low −.1759	2.30**	.67	<.001
Medium .0000	.95*	.47	.051
High .1759	−.39	.71	.582

N = 48 teams, N = 43 leader scores for team innovation and challenging assignments.
*$p < .05$; **$p < .001$.

and innovation, when high levels of age diversity are not identified. Therefore, hypothesis 2 and hypothesis 3 (mediation) are partially confirmed as they're contingent to the level of age diversity, and hypothesis 4 (moderation) is confirmed in its entirety.

Finally, our analysis of control variables shows that challenging assignments and support for innovation were positively related to team innovation at: B = .66, SE =.11, p = <.001 and B = .70, SE =.33, p = .042 respectively. As expected, the simple moderation model results showed similar effects for both variables; these and all other results are discussed in the next section.

Discussion

Our work aims to advance in the understanding of how military teams can create the condition to generate and implement innovative ideas, addressing a specific call in the military research agenda focusing on the role of cognition and team composition (Goodwin et al., 2018). More specifically, in our work we studied how a specific facet of team composition (age variety) can play a role in how military teams can generate innovative performance. Additionally, another critical issue in military team research is to understand the role of cognition, in order to improve cognitive competences within military teams, as teamwork with the military context is becoming each time more cognitive (Cooke, Gorman, Myers, & Duran, 2013). Specifically, task complexity often precludes a single individual from accomplishing the task, as no individual alone has sufficient information, skills, or time required. Therefore, understanding cognitive mechanism that facilitate integration of knowledge and guide coordination and processes, results key to facilitate military teamwork efficacy.

Additionally, focusing on the conditional indirect effects of perceived organizational values, and by addressing research calls on the contextual factors related to creativity and innovation, we've identified that VIN is positively related to TMS, which in turn promotes innovative behavior in military teams depending on the levels of age diversity. VIN facilitates TMS as team members are more eager to discuss information about their individual expertise and tasks with the purpose of innovating. We argued that this effect is due to employees perceiving that their military organization values, for example, flexibility and information sharing which are related to innovation (McDonald & Gandz, 1991, 1992). Moreover, we've found that the effect of TMS on team innovation is reduced by age diversity as scores are weaker at medium levels of this moderator and non-significant at higher levels. The positive effect of TMS on innovation goes in accordance with previous studies that found a positive relationship between the two (e.g., Peltokorpi & Hasu, 2016; Zhang & Kwan, 2018). Our results also indicate that VIN, although relevant for promoting team innovation, doesn't directly encourage team members to collectively generate and implement new ideas into the workplace. For teams to carry out these behaviors is also necessary that employees actively develop and use a collective system like TMS. For our sample, this was only straightforward at low levels of age diversity. These results highlight the importance of considering the level of age diversity within the team as, for our case, more of it translated into less creative ideas being shared and implemented into the workplace. Moreover, by observing the effects of the control variables, we've found that both support for innovation and challenging assignments were positively related to team innovation. This goes in accordance with previous arguments for both concepts on their relationship with innovation (e.g., Anderson & West, 1996; De Jong & Kemp, 2003).

Our study contributes to the literature on team innovation and team diversity by integrating arguments for perceived organizational values and by identifying age diversity as a contextual factor. Our results favor the idea of studying how team members perceive that their organization values aspects related to innovation, and the fundamental role of team emergent states like TMS to transform their effect into idea generation and implementation in military units; to our knowledge, this relationship has not been explored yet. Moreover, we contribute to research on team diversity by showing that the relationship between TMS and innovation is contingent on the level of age diversity. Indeed, the contextual effect of team diversity has begun to be explored (e.g., Mitchell et al., 2016), and recent studies

favor the idea that complex dynamics may be the case for diversity in teams (Joshi & Neely, 2018), further justifying research like ours on the different roles that diversity may have other than that of a predictor variable. Finally, we find these interactions in groups embedded in a military context also adding to research on military teams and their innovative capabilities. Our study further develops the understanding and the effects of age differences in the military and the importance of collective information sharing for boosting innovation in military contexts.

Furthermore, valuing, providing support, and encouraging experimentation, flexibility, cooperation and the implementation of thoughtful changes within the organization may help teams to better coordinate their efforts, take better decisions, and innovate, which are outcomes related to TMS (e.g., Michinov et al., 2008; Zhang et al., 2007). Employees perceive the values that their organization embraces and react congruently; if innovation is cherished, employees may be eager to share information and orient their efforts toward innovative solutions. This further promotes the implementation of team training for encouraging familiarity, shared experiences, and therefore, TMS in teams (Ren & Argote, 2011). In this line, military practitioners can take advantage of specific trainings on who knows that have been shown to be effective in diverse teams to enhance higher TMS and better functioning (Antino, Rico, Sanchez-Manzanares, & Lau, 2013). Moreover, team training centered on age diversity may also help team members to be aware of any bias toward other groups and counter any negative conditions caused by a variety of differences (Mor Barak, 2005). Additionally, the model tested in this article is particularly important for designing managerial strategies that take into account the need to support innovative initiatives but that don't consider team collaborative processes. Finally, we recommend innovative strategies to not only center on employees generating new ideas, but also to emphasize on teams, as different people offer a larger pool of resources in which to create new and better solutions, and to guide these initiatives toward their implementation to make the new ideas useful.

Limitations and future directions

This study is not without its limitations. Although we found a relationship between our variables confirming the proposed moderated mediation model, our results are drawn from correlational methods that do not necessarily justify for causality. Carrying out longitudinal design studies, or through experimentation, may allow us to draw conclusions on the causal interactions of our model. Furthermore, our study only comprised 48 teams (and 43 team leaders) which may be considered a small sample size, however, finding relationships and moderation effects with small samples indicates large effect sizes (Cohen, 1992). Additionally, we could've also used more objective criteria for measuring innovation (e.g., number of suggestions implemented), compared to only asking the team leader about their team's behavior, as more reliance can be placed on these measures (Hülsheger et al., 2009). However, due to the nature of military work any patents or other evidence for innovation don't represent for example tactical advances or improvements in between-member communication, which may be the most common type of innovations developed by the teams we evaluated. Moreover, future studies could analyze our model by adopting a longitudinal design, gather a larger sample size, and observe actual changes (innovations) to further test the results found in this article. Additionally, our results could be reinforced by research designs involving observational measures different from self-reported measures, for example quasi-experimental research design within some training program that allow researcher to adopt other measures for TMS or any other cognitive mechanism.

Finally, it could be interesting to explore the multilevel interactions related to the used variables. For example, future studies could trace a link between HR strategies with team innovation by exploring how these managerial activities can influence the way that employees perceive the values that the organization cares about, and then how these perceptions promote or disrupt innovative behaviors. These future studies can also confirm the importance of the team leader in shaping these perceptions, examine the effects of team temporality in our model (e.g., recent teams vs. experienced teams), and further analyze the contextual role – or the different modalities (e.g., Bunderson & Van der Vegt, 2018) – that diversity can adopt within organizational settings.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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