



Full length article

Strategies for improving decision making of leaders with ADHD and without ADHD in combat military context

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ARTICLE INFO

Keywords:

Leadership
Military
ADHD
Decision-making

ABSTRACT

Environment-leader congruency yields better adaptability manifested in better decision-making. The military combat environment offers advantages for leaders with ADHD; though they are expected to encounter difficulties due to executive dysfunction. This research aspired to increase the congruency effect for leaders with ADHD in a stressful military environment through interventions that improve executive decisions. We hypothesized that making decisions in isolation will improve decision quality overall; while face-to-face interventions that activate commitment and focused attention will promote decision-making particularly among respondents with ADHD. A large-scale controlled study explored candidates' responses to combat dilemmas under four randomly assigned interventions: Isolation, Simple face-to-face, Withholding response face-to-face; and Control-peer-group classroom setting. The main effects of improved decision-making in isolation and simple face-to-face settings were shown across groups. Further, both face-to-face interventions interacted with ADHD, yielding stronger effects and better performance among participants with ADHD as compared to those without ADHD. Current findings highlight the importance of finding suitable conditions for enabling improved executive decisions among candidates with ADHD. Introducing economical and easy-to-operate face-to-face interventions enhances decision quality in a highly represented neurodiverse population. Current findings may generalize to an array of high-risk/high-stress working environments, providing ecologically relevant support for young leaders from neurodiverse populations.

Introduction

Leaders, specifically, leaders in the army, have a crucial and pivotal role in safeguarding human lives (Lopez, 2020; Wong et al., 2003). Better led forces have repeatedly been victorious over poorly led forces (Bass, 2007). Therefore, understanding what it takes to succeed as a military leader and how to improve military leaders' functioning is vital for the well-being of individuals and the community. Since leaders differ in leadership characteristics, personality, and abilities (Luria et al., 2019; Paunonen et al., 2006), they may succeed more in certain conditions compared to others (Olinover & Geva, 2021; Phaneuf, Boudrias, Rousseau, & Brunelle, 2016).

One prevalent feature in the population is attention deficit hyperactivity disorder (ADHD; Danielson et al., 2018; van Lieshout et al., 2016), a neurodevelopmental disorder characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity (APA, 2013). In referring to leaders with ADHD, the majority of research focuses

on symptoms that impose adaptation difficulties (Brook et al., 2013; Wilson, 2013). Some research claims that ADHD prevents one from not only attaining a position of leadership but also enacting the demands of a leadership role successfully (Issa, 2015; Kessler et al., 2009). Nevertheless, reality demonstrates the success of many meaningful leaders, including generals and presidents, who exhibit characteristics of ADHD (Guyer, 2000; Kruse, 2019; Stolberg, 2019). Observing these leaders raises some essential questions regarding limitations deriving from their ADHD, compared to their success in the field. Taking the neurodiversity movement's emphasis on the richness of different kinds of brains (Armstrong, 2010), it seems that ADHD may offer some advantages that may have a beneficial value given suitable conditions (Rice, Marra, & Butler, 2007; Timimi & Taylor, 2004). Certain environments may facilitate and/or inhibit the functioning of individuals with ADHD (Rosenberg, 2006). In this research, we lean on those cases of leadership success and claim that combat leaders with ADHD may well succeed in their decision-making compared to leaders

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without ADHD. We further offer suggestions for suitable conditions and interventions that may improve success.

Environment-Person congruency as influencing ADHD

The influence of the environment on ADHD may be explained by the congruency assumption, originally formulated by Holland (1996), defining achievements as associated with the extent of the congruency and compatibility between individuals and their environment (Gottfredson & Holland, 1990; Oh & Moon, 2014). The environment is a moderator of outcomes for individuals with ADHD (Toplak et al., 2013). For example, altering or avoiding certain stimuli characteristics of the physical environment improve ADHD functioning (Waschbusch & Hill, 2003). Hence, in several kinds of environments, ADHD-related constraints may act as compensatory processes and stimulate the acquisition of different skills and strategies that promote functioning (Borger & van der Meere, 2000; Music, 2016). Inattention and hyperactivity-impulsivity are not static symptoms but rather are highly dependent on context (Sonuga-Barke, 2003). Therefore, individuals with ADHD may function effectively in some environments, compared to others. Studies have shown that a promoting environment for ADHD will include characteristics that fit high arousal parameters (Weiss et al., 2008), such as unpredictable situations (Swanepoel et al., 2017), demand for coping with motivational conflict issues, management of several stimuli simultaneously, abrupt transitions and changes, along with prompt reward and immediate reaction (Brown, 2013; Delisle & Braun, 2011; Sonuga-Barke, 2005). At the same time, highly structured environments are efficacious for ADHD since they promote organizational skills (Solanto et al., 2010). Taken together, an environment that includes both strict and organized instructions, as well as dynamic and arousing demands, may possibly be the military environment, in which higher congruency between the army and individuals with ADHD is expected.

The military environment and leaders with ADHD

There is a gap in the literature concerning military leaders with ADHD. However, there is some information about soldiers with ADHD, describing mainly difficulties in military life (Avni, 2010; Bahn et al., 2006; Hanson et al., 2012). For example, U.S soldiers with ADHD were shown to exhibit academic inferiority (Rice, Marra, & Butler, 2007), as well as adjustment and psychiatric disorders (Larson et al., 2011; Nock et al., 2015; Schmitz et al., 2012). On a cultural level, there are negative correlations between ADHD and the quality of life of soldiers in the Taiwanese (Yang et al., 2013) and Korean armies (Chao et al., 2008; Seo et al., 2014), and also a positive relation between ADHD and adjustment difficulties in Israeli soldiers (Shelef et al., 2016). Nevertheless, dysfunctional styles are weeded out early and do not proceed in the military rank structure (Russell, 2000). Indeed, several studies indicate the proper functioning of soldiers with ADHD in the military system (Jaber et al., 2015; Rice et al., 2013). Soldiers with ADHD may find in the army, especially in the combat environment, potential moderating factors that even promote their functioning, such as risk and excitement (Weiss & Murray, 2003), higher energy levels, and physical actions (Kaufman et al., 2011), demands for quick reactions, and attention distribution between assignments (Jaber et al., 2015). Along with the environmental benefits of activeness and high arousal, the military organization is highly structured and might provide another angle of a positive environment for those with ADHD (Ivanov & Yehuda, 2014), as it has been shown that interventions that promote organizational skills and enhanced environmental structure are highly efficacious in ADHD (Solanto et al., 2010). Finally, the military environment has a high turnover of recruits, which allows rapid advances in status (i.e., courses and ranks), and a conducive setting for personal growth (Dar & Kimhi, 2004). These environmental characteristics enable soldiers with ADHD the opportunity to demonstrate

non-scholarly abilities, which may have a compensating value (Fond & Green-Altalef, 2010), and also to assume initiative and responsibility, which can result in the nomination and attainment of leadership positions.

Specifically, regarding military combat leadership, ADHD has additional advantages. One relevant beneficial leadership aspect refers to the positive connection between ADHD inhibition deficits (Nigg, 2000; White & Marks, 2004) and creativity in problem-solving (White & Shah, 2006). In military environments, these qualities are often needed when making important, unprecedented decisions that require creative out-of-the-box thinking (Allen, 2009). Another meaningful combat leadership aspect is related to entrepreneurship, which demands high tolerance for instability, proactiveness, and flexibility (Baron, 2008; Shane & Venkataraman, 2000), a quality that is positively related to ADHD (Lerner et al., 2019; Thurik et al., 2016). It may be that combat leadership is an appealing role for individuals with ADHD as it rewards ADHD-relevant characteristics (Montes & Weatherly, 2014), leading to higher rates of soldiers with ADHD in combat roles compared to other military roles (Rosellini et al., 2015). This may potentially lead to better functioning of combat leaders with ADHD, suggesting the importance of this population being represented in military leadership. To maximize the success of military leaders with ADHD, certain intervention techniques may be taught to help change some of the environmental conditions and improve ADHD functioning, in a way that increases environment-ADHD congruency, leading to improved performance in leadership and decision making.

Decision making in congruent conditions: Facilitating interventions

The ability to develop and implement appropriate responses and decisions to a variety of problems defines leadership (Mumford et al., 2000). Combat leaders in particular often operate in complex situations (Hannah et al., 2013; Hedlund et al., 2003), and must enact appropriate decision-making that leads to adaptable responses (Chan, 2000; Lepine et al., 2000). Since environment-leader congruency yields better adaptability, we expect that it will also be manifested in better decision-making. Moreover, we suggest that increasing this congruency effect will improve decision-making. Since leaders with ADHD differ from those without ADHD in crucial parameters regarding military combat leadership, it is argued that certain strategies of interventions will differentially impact the decision-making of these two groups. Specifically, individuals with ADHD encounter difficulties regarding their ability to dismiss distractions as well as attention and control disabilities (Salmi et al., 2018). Thus, interventions that increase focusing on the mission and reduce impulsive reactions may improve their decision-making. The focus may be increased either by external or internal elements (McNevin et al., 2003). A quiet testing room for making the decisions while in isolation may reduce irrelevant environmental stimuli that intrude cognitive processes and facilitate reliance on internal cognitive resources (Choi et al., 2014). An external element to consider is providing social support, such as feedback and supervision of a meaningful other, which may be particularly effective in supporting participants with ADHD (Mastoras, Saklofske, Schwean, & Climie, 2015). Relying on the distinguishable underlying network related to social feedback and response inhibition in adults with ADHD as compared with controls, (Dibbets et al., 2009), we expect leaders in general, particularly those with ADHD to show improved performance in conditions that promote this network. We offer three different interventions that are expected to influence making combat leadership decisions as compared to a control classroom setting:

1. **Isolation setting:** Intuitively, the ability to concentrate and focus for all populations may worsen in the face of distractions

(Pelham et al., 2011). Research has emphasized the importance of the ability to concentrate in a quiet isolated workplace for better outcomes (Banbury & Berry, 2005), and the problematic impact of another person that can intrude functioning by the mere presence of characteristics like gender and cultural differences (Altakhaineh et al., 2019). Specifically for individuals with ADHD, who have difficulty inhibiting distractions to perform better (Kercood & Grskovic, 2010), unenriched environments reduce impulsive choices (Perry et al., 2008). This may hold for participants with typical attention as well as those with ADHD. Findings comparing context effects on executive functions of boys with and without ADHD indicate that changing the level of stimulation reduces the amount of effort required by participants with ADHD, but is effective for all, and is not expected to be beneficial for improving the bottom-line quality of the performance on the task uniquely for ADHD (Lawrence et al., 2002; Lewandowski, Martens, Clawson, & Reid, 2021). Operating in an isolated environment during the decision making task reduces distractions that have been shown to have some adverse effects on performance for all populations (Barry, Fisher, DiSabatino, & Tomeny, 2016; Lewandowski, Martens, Clawson, & Reid, 2021; Lovett, Lewandowski, & Carter, 2019), leading to less effort investment in taking the test and better performance for both leaders with and without ADHD. Therefore, we assume better performance in isolation irrespective of group.

2. Simple face-to-face setting: Thoughts and actions arise from interactions between individuals and the environment in which they exist (Jensen & Hoagwood, 1997), affecting in turn, the individual's cognitive function (Auvray et al., 2009; De Jaegher et al., 2010). It has been demonstrated that people behave differently when they are being observed (Leary & Allen, 2011), and the mere understanding that someone is watching and paying attention to the acting agent has effects on a multitude of tasks (Bateson et al., 2006; Ernest-Jones et al., 2011), even when no explicit feedback is provided. Face-to-face interactions include observation and attention from another person, in ways that are known to improve performance (Haley & Fessler, 2005; Platania & Moran, 2001), likely due to implicit feedback that increases prosocial behavior (Cialdini & Goldstein, 2004) and motivation to succeed (Bénabou & Tirole, 2006). Caveats to this notion suggest opposite paths of impact, deriving from examiner presence, regarding performance speed and accuracy, depending on task complexity (Bond & Titus, 1983). Also, some populations may be affected differently by the interaction with an examiner. For example, children with Autism demonstrated no improvement compared to controls in the presence of an experimenter, which normally generates social facilitation effects (Chevallier et al., 2014). Alternatively, children with ADHD were found to improve performance in a similar situation (Gidron, Sabag, Yarmolovsky, & Geva, 2020). It may be that making decisions in the presence of a person with whom you interact directly and form rapport (Gidron, Sabag, Yarmolovsky, & Geva, 2020) facilitates cooperation (Drolet & Morris, 2000). This interaction may lead to implicit feedback (Kleiman et al., 2015) that compensates for the attentional problems (Sergeant, 2000), aberrant motivation (Luman et al., 2010), poor discipline, and self-regulation (Power, 1992) associated with ADHD. Thus, contemplating solutions concerning social dilemmas while in face-to-face with another person provides potential opportunities for forming a supporting rapport (Barnett et al., 2018), implicit feedback (Tickle-Degnen, 2006), and external social supervision (Bertoni et al., 2013). Such a context may be perceived by individuals with ADHD as reinforcing feedback and increasing cooperation and success (Carlson et al., 2000). It has been found that leaders with ADHD

need more personal reinforcement to improve their performance or perform similar to matched controls (Sagvolden et al., 2005). This leads to the assumption that the simple face-to-face intervention, in which the leader makes a decision and reports that decision to the examiner, will more strongly affect leaders with ADHD, as compared to leaders without ADHD who will rely less on such a 'holding' setting.

3. Withholding a response in a face-to-face setting: Effective self-control can be viewed as willful and conscious inner cognitive and mental acting that requires resources and effort (Tangney et al., 2004). One expression of self-control is the ability to withhold a prepotent response (Barkley, 1997), which enables possible inner cognitive information processing that promotes performance (Botvinick et al., 2001; Kahneman, 2011). Since individuals with ADHD, as compared to those without ADHD, exhibit deficits concerning impulsivity (Barkley, 1998), disinhibition (Nigg, 2001; Wodka et al., 2007), and lower self-regulation (Zorcec & Pop-Jordanova, 2010), they encounter difficulties in using time gaps for decision making (Parker & Boutelle, 2009). Thus, they tend to react immediately to the stimulus without noticing or fully understanding causation (Giddan, 1991). A recent formulation of Douglas' model (2008) suggests that complex effortful control processes contribute to efficient attention and inhibition. Therefore, when individuals with ADHD are trained to manage impulsive behavior and inhibit irrelevant thoughts, their attention skills improve (Colombo et al., 2017). We assume then that cognitive intervention of delaying the response in front of an examiner will have positive effects on attention and decision-making processes for those with ADHD, as compared to leaders without ADHD.

Regarding the above three interventions, and taking into consideration differences between leaders with and without ADHD and their functioning in the military environment, we aimed to test the following operational hypothesis:

1. Performing in an isolated setting will be related to improved decision making compared to the classroom setting for leaders irrespective of group
2. Performing in a simple and withholding face-to-face setting will be related to improved decision-making relative to the classroom setting among leaders with ADHD, compared with leaders without ADHD.

Method

Participants

A population of 1301 combat squad commanders (average age 21.03 ± 0.987 years; 87.9% males) was recruited between 2018 and 2019. All participants came from combat units in the Israel Defense Force (IDF) and consisted of Israeli natives who spoke Hebrew fluently. All participants were candidates for an officer role and all filled out a questionnaire indicating high motivation to become an officer (mean = 3.9 ± 0.41 ; responses included a 4 point Likert scale, 1 = no motivation, and 4 = very high motivation). Participants were employed solely by the IDF and received standard uniform salaries. One hundred twelve (8.6%) participants were identified as having ADHD (see Table 1 for demographic information); consistent with previous work showing that the propensity of cadets with ADHD is higher than the expected risk in the general population (Matte et al., 2015). Gender, age, length of service before course admittance, and intelligence were comparable in both groups.

Table 1
Descriptive statistics of commanders with and without ADHD.

	without ADHD	with ADHD	Statistic
Gender	1.12 (0.01)	1.18 (0.04)	t(1299) = -1.93, p = .05
Age	21.0 (0.03)	20.9 (0.08)	t(1299) = 1.26, p = 0.21
Service months	17.2 (0.16)	17.3 (0.58)	t(1299) = -0.15, p = 0.88
Intelligence T score*	66.8 (0.40)	67.2 (1.30)	t(1299) = -0.33, p = 0.74
N	1189	112	

Note. Means are presented with standard errors in parentheses. ADHD is coded as 1 = ADHD, 0 = no ADHD. Gender is coded as 1 = Male, 2 = Female. ADHD = Attention-Deficit/Hyperactivity Disorder; Intelligence score = based on Intelligence Rating Score (Bodner et al., 2006).

Measurement tools

1. **Adult ADHD Self-Report Scale – ASRS** (Hebrew version): The ASRS screening scale is a structured DSM-based self-report questionnaire measuring inattention and hyperactivity-impulsivity symptoms of ADHD. It includes 18 questions for each of the 18 DSM-IV Criterion. Participants respond to a 5 point Likert scale about how often each symptom occurred over the past 6 months (Ustun et al., 2017). A score above 17 points for all symptoms of ADHD is referred to as likely to have ADHD. Each ASRS symptom measure is significantly related to the comparable clinical symptom rating (Kessler et al., 2005).
2. **Intelligence Rating Score – IRS**: The IRS measures intellectual ability (Bodner et al., 2006). The score ranges from 10 to 90 and includes an average of 4 psycho-technic tests (mathematical, formative, and linguistic understanding) equivalent to an intelligence test. A total score is calculated equivalent to a normally distributed IQ score (Bodner et al., 2007).
3. **Combat Leadership Dilemmas Test – CLDT-1 and CLDT-2** – Participants filled out two Hebrew versions of a military situational judgment test (SJT) designed to assess the judgment and decision-making of a combat commander in the military context (McDaniel & Nguyen, 2001). Each version of the test consists of 16 different dilemmas representing different realistic combat military situations from training, routine, and the battlefield. Dilemmas were drawn from a pool of 128 real-life experiences reported by IDF junior commanders and officers that they encountered during their military experience. Five solutions for each dilemma were offered and ranked by 150 combat commanders. Sixteen items with full agreement among the top two best solutions were included in the CLDT-1, and the following 16 with the most agreement (on average 93% agreement) were included for the CLDT-2 (Goldenberg, 2010). The first dilemma is used for practice, and the next 15 are included in the test scoring. For each item, the participant is requested to choose the best solution and the second-best solution. A final score consists of the sum of separate scores given for each dilemma according to the best and second-best choice, ranging from 0 to 3 points for each dilemma. Participants received 3 points if both 1st and 2nd choices were correct, 2 points if only the top-choice was correct or the order between two best choices was reversed, 1 point if the second-best choice was correct but not the first, and 0 if none of the top two choices were correct. It has been found that situational judgment tests have construct and criterion-related validation (Cullen et al., 2020; Patterson, Lievens, Kerrin, Munro, & Irish, 2013) in general. Specifically, the SJT of the CLDT1 is strongly correlated with the successful functioning of officer cadets (Ron, 2019), which further correlates with success in real-life leadership performances (Kelly et al., 2014) as well as promotion (Hanser & Oguz, 2015).

Example of a CLDT item

You are a commander in a combat squad. You have noticed one of your subordinates texting on the phone while guarding. A day before, you have already warned your soldiers about special alerts in the area. What will you do?

1. Wait until the soldier will come and report his offence.
2. Consult with the senior officer and wait for his decision.
3. Ask one of the other subordinates to comment the soldier.
4. Surprise the soldier on his guarding shift, catch him in action and scare him.
5. Invite the soldier for a conversation at the end of his shift, and ask him if he wants to tell me something, but also punish him in front of the squad

Research design

The ethics committee at Bar-Ilan University, as well as the IDF department of behavioral science, granted ethical and non-classified military approval of the study. Study participants were recruited during a routine screening session for potential combat commanding, to which all of them expressed motivation in advance. All soldiers came to this meeting in a group and waited for their peers to finish before leaving together. Study participants were recruited during a break after they filled out the CLDT-1 while they were waiting for an interview and were asked if they wanted to take part in research exploring interventions to improve decision-making in combat commanders. Participation in the study did not extend their overall waiting time and did not influence the overall waiting time of the group. All participants volunteered to take part in the research of their own volition and were informed that their decision to participate or not, as well as their performance on the CLDT-2, would have no implications on their future army experience and that participation was anonymous. To assess individual motivation levels during the task the experimenter reported their impression of the soldier's motivation, investment, and seriousness for participants. This score was reported for those who had personal interactions with their examiner (i.e., the face-to-face conditions N = 499) after they completed the CLDT-2. The examiners reported on a 5-point Likert scale (1 = lowest, 5 = highest) and overall participants' motivation levels were rated highly on these measures (mean = 4.8 ± 0.40).

A cross-sectional research design was employed, comparing commanders with and without ADHD across 4 intervention conditions: class setting, isolation, simple face-to-face, and withheld face-to-face. An additional condition was conducted for other purposes and was thus excluded from the current manuscript. Participants in the excluded condition were well balanced between all conditions on demographic levels. Data were analyzed using RStudio® (RStudio Team, 2021). Demographic information as a function of the intervention group is detailed in Table 2.

All participants fulfilled a standard intelligence test during their initial sorting and appraisal session upon being recruited into the army. About a year later, combat soldiers underwent further standard sorting and assessment for a potential officer role.

Participants first filled out the ASRS questionnaire, then were given the first paper-pencil version of CLDT-1 in a classroom with other examinees under the supervision of a neutral, non-interacting examiner. Study volunteers then performed a second paper-pencil version of CLDT-2 around 30 min later. No electronic devices, such as computers or tablets, were utilized for the interventions to replicate the baseline paper-pencil version and to avoid possible distractions caused by

Table 2

Demographic information as a function of the intervention group.

	Model 1 ADHD	Model 2 Age	Model 3 Gender	Model 4 Intelligence	Model 5 Months of Service
Isolation	−0.016 (0.012)	0.376*** (0.072)	0.008 (0.024)	0.275 (1.023)	0.829 (0.426)
Simple face-to-face	−0.002 (0.022)	0.323*** (0.075)	0.015 (0.025)	0.303 (1.066)	0.756 (0.443)
Withheld face-to-face	−0.009 (0.022)	0.441*** (0.074)	0.002 (0.025)	1.118 (1.052)	1.359** (0.437)
Adjusted R ²	−0.002	0.036	−0.002	−0.001	0.006
F statistics	0.214	16.96***	0.138	0.378	3.684*

Note. Unstandardized regression coefficients are presented with standard errors in parentheses. ADHD was coded as 1 = ADHD and 0 = no ADHD. Gender was coded as Male = 1, Female = 2. Interventions were dummy coded with the control condition as the reference: Isolation = 1, other conditions = 0; Simple face-to-face = 1, other conditions = 0; Withheld face-to-face = 1, other conditions = 0. * = $p < .05$, ** = $p < .01$, *** = $p < .001$; ADHD = Attention-Deficit Hyperactivity Disorder; Intelligence score = Average of 4 psycho-technic tests (mathematical, formative, and linguistic understanding) equivalent to intelligence test (Bodner et al., 2006), score ranges from 10 to 90.

these devices (Sommerich et al., 2007). Participants were then randomly assigned into 3 intervention conditions and a control group (see Table 3):

1. Control-Classroom setting: Participants independently filled out CLDT-2 in a classroom under the same conditions as part 1; with an examiner present, surrounded by peers who were examined simultaneously in a typical class test format. Importantly, the soldiers were not permitted to interact with their peers or the examiner during testing. In the Israeli military environment (as in other armies), this is the default condition for examining soldiers; therefore, at face value, this condition serves as a baseline for typical performance without the addition of the study's novel interventions and provides the most natural comparison for how the added interventions may improve performance.
2. Isolation setting. Participants filled out the CLDT-2 while sitting alone without peers or an examiner present.
3. Simple face-to-face setting. Participants filled out the CLDT-2 while sitting in a room without peers, with an examiner with whom they interacted in a face-to-face manner. Soldiers were instructed to silently read each dilemma to themselves and then to answer aloud to the examiner. Examiners recorded the response.
4. Withheld face-to-face setting. Participants filled out the CLDT-2 while sitting in a room without peers, with an examiner with whom they interacted in a face-to-face manner. Participants were instructed to silently read each dilemma to themselves, decide their response, and wait 12 s before answering aloud to the examiner. Examiners recorded the responses as in condition 3.

Results

Data is available on the Mendeley Data repository (<https://doi.org/10.17632/7m2b7pbtck.1>). Descriptive statistics and bivariate correlations between variables are presented in Table 4.

Table 3

Interventions, contents, and purposes.

Intervention	Control- Classroom	Isolation	Simple face-to-face	Withheld face-to-face
Intervention content	Participants independently filled out the second part of the dilemmas test in a classroom under the same conditions as part 1.	Participants fulfilled the dilemmas test in an isolated room in the absence of the examiner	Participants read silently each dilemma while the responses were hidden. Immediately following the examiner uncovered the responses and the participant told the examiner the first and second-best choices aloud. Examiners recorded the responses.	Participants read silently each dilemma while the responses were hidden. Immediately following the examiner uncovered the responses. After choosing the first and second-best choices, the participant waited 12 s and told the examiner the first and second-best choices aloud. Examiners recorded the responses.
Intervention purpose	A baseline for comparing the influence of the interventions on commanders with and without ADHD	Proving that executing in silence, will improve the decision-making of both groups due to reduced distractions.	Improving decision-making of commanders with ADHD by inducing external regulation, feedback, and supervision that are crucial for ADHD symptoms.	Improving decision-making of commanders with ADHD by compensating natural impulsivity, disinhibition, and lack of self-regulation.

To test our hypotheses regarding ADHD, the facilitating interventions, and their interactions in predicting leader performance, linear regression analysis with heteroskedasticity-consistent robust standard errors (Meslec, Curseu, Fodor, & Kenda, 2020; White, 1980) were conducted with CLDT-2 scores as the predicted variable. The intervention variable was dummy coded with the control-classroom setting intervention as the reference. The results of the regression analysis are presented in Table 5, with Model 1 reporting ADHD and intervention main effects; Model 2 reporting main effects while controlling for age, gender, intelligence, months of service, and CLDT-1 scores; Model 3 reporting main effects and interactions between intervention conditions and ADHD; and Model 4 reporting main effects, interactions, and control variables.

Overall, the model was significant and explained 6.6% of the variance in CLDT-2 scores $F(12, 1288) = 8.826$, $p < .00001$. Notably, ADHD did not significantly predict CLDT-2 scores. Of the offered interventions, main effects were noted for isolation and the simple face-to-face conditions, suggesting that these interventions significantly predicted CLDT-2 performance irrespective of group.

We then explored the moderating effect of ADHD on intervention conditions. Findings revealed a significant ADHD by Simple face-to-face interaction; as well as an ADHD by Withheld face-to-face Response interaction. The effect size for this analysis ($F^2 = 0.07$) was small to moderate, consistent with effects sizes reported in similar research (Lawrence et al., 2002). Post-hoc analysis using estimated marginal means with Tukey correction indicate that in the Simple- and Withheld face-to-face intervention conditions, effects were stronger among participants with ADHD as compared to those without ADHD (Simple face-to-face: $t = -2.717$, $p = .007$; Withheld face-to-face: $t = -2.599$, $p = .009$; Fig. 1). Notably, post-hoc analysis reveals that compared to the simple face-to-face intervention, the withheld intervention did not show increased performance among leaders with ADHD ($t = 0.479$, $p = .964$).

Table 4

Means, standard deviations, and correlations between decision outcome scores (CLDT1, CLDT2), demographic characteristics, and strategy conditions, and interaction terms.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. CLDT2	25.82	3.46													
2. CLDT1	29.79	3.93	−0.14**												
3. Age	21.03	0.99	0.09**	0.07**											
4. ADHD	0.09	0.28	0.05	−0.11**	−0.03										
5. Intelligence	66.83	13.69	0.01	0.07*	0.02	0.01									
6. Months of Service	17.25	5.71	0.15**	0.09**	0.59**	0.00	−0.04								
7. Isolation	0.20	0.40	0.09**	−0.14**	0.08**	−0.02	−0.00	0.02							
8. Simple face-to-face	0.18	0.38	0.05	−0.02	0.05	0.01	−0.00	0.02	−0.24**						
9. Withheld face-to-face	0.19	0.39	−0.00	−0.07**	0.11**	−0.01	0.03	0.07*	−0.24**	−0.23**					
10. Control – classroom	0.43	0.50	−0.11**	0.19**	−0.19**	0.02	−0.02	−0.08**	−0.44**	−0.41**	−0.42**				
11. Isolation × ADHD	0.02	0.12	0.00	−0.06*	0.04	0.41**	−0.01	0.02	0.25**	−0.06*	−0.06*	−0.11**			
12. Simple face-to-face × ADHD	0.02	0.13	0.09**	−0.07*	−0.02	0.42**	0.01	0.01	−0.06*	0.27**	−0.06*	−0.11**	−0.02		
13. Withheld face-to-face × ADHD	0.02	0.12	0.09**	−0.08**	0.01	0.41**	0.02	0.06*	−0.06*	−0.06*	0.26**	−0.11**	−0.02	−0.02	
14. Control – classroom × ADHD	0.04	0.19	−0.05	−0.02	−0.06*	0.66**	0.00	−0.04	−0.10**	−0.09**	−0.10**	0.23**	−0.03	−0.03	−0.03

Note. M and SD are used to represent mean and standard deviation, respectively. ADHD was coded as 1 = ADHD and 0 = no ADHD. Gender was coded as Male = 1, Female = 2. Interventions were dummy coded with the control condition as the reference: Isolation = 1, other conditions = 0; Simple face-to-face = 1, other conditions = 0; Withheld face-to-face = 1, other conditions = 0. * indicates $p < .05$. ** indicates $p < .01$.

Table 5

Multiple linear regression table with CLDT-2 as the predicted variable.

	Model 1	Model 2	Model 3	Model 4
ADHD	0.638 (0.395)	0.483 (0.392)	−0.381 (0.528)	−0.382 (0.551)
Isolation	1.060*** (0.260)	0.780*** (0.265)	1.055*** (0.267)	0.775** (0.268)
Simple face-to-face	0.799** (0.272)	0.637* (0.266)	0.552* (0.277)	0.409 (0.270)
Withheld face-to-face	0.444 (0.271)	0.164 (0.273)	0.191 (0.279)	−0.047 (0.276)
Isolation × ADHD			0.144 (1.036)	−0.161 (1.063)
Simple face-to-face × ADHD			2.742* (1.096)	2.470* (1.085)
Withheld face-to-face × ADHD			2.969** (1.045)	2.425* (1.056)
Age		−0.059 (0.121)		−0.028 (0.120)
Gender		−0.891** (0.306)		−0.808** (0.306)
Intelligence		0.003 (0.007)		0.003 (0.007)
Months of service		0.096*** (0.020)		0.091*** (0.020)
CLDT-1		−0.120*** (0.029)		−0.118*** (0.028)
Intercept	25.327*** (0.132)	29.457*** (0.132)	25.420*** (0.132)	28.806*** (0.132)
Adjusted R ²	0.015	0.058	0.025	0.065
F Statistic	5.884***	9.975***	5.841***	8.626***

Note. Unstandardized regression coefficients are presented with robust standard errors in parentheses. ADHD was coded as 1 = ADHD and 0 = no ADHD. Gender was coded as Male = 1, Female = 2. Interventions were dummy coded with the control condition as the reference: Isolation = 1, other conditions = 0; Simple face-to-face = 1, other conditions = 0; Withheld face-to-face = 1, other conditions = 0. * indicates $p < .05$. ** indicates $p < .01$.

Discussion

Military combat leadership does not only involve goal achievement and fulfillment of missions, but also matters of life and death of direct subordinates and, at times, the fate of a whole nation (Cohen, 1999). Therefore, identifying ways of improving leaders' decision-making may have a crucial impact. Despite relatively high individual-environment congruency (Archer, 2015), combat leaders with ADHD frequently contend with difficulties evolving from their deficit

(Fruchter et al., 2019; Zur et al., 2018), apparently due to executive dysfunctions (Silverstein et al., 2020). In this study, we explored specific easily employable interventions that possibly support executive functions in leaders who are challenged with ADHD, as compared with those who are not. We hypothesized that interventions that are designed to activate concentration of mental resources and even more so, contexts that are designed to improve the motivation to engage will improve decision making particularly of leaders with ADHD. Findings have shown that when given the appropriate facilitators, young

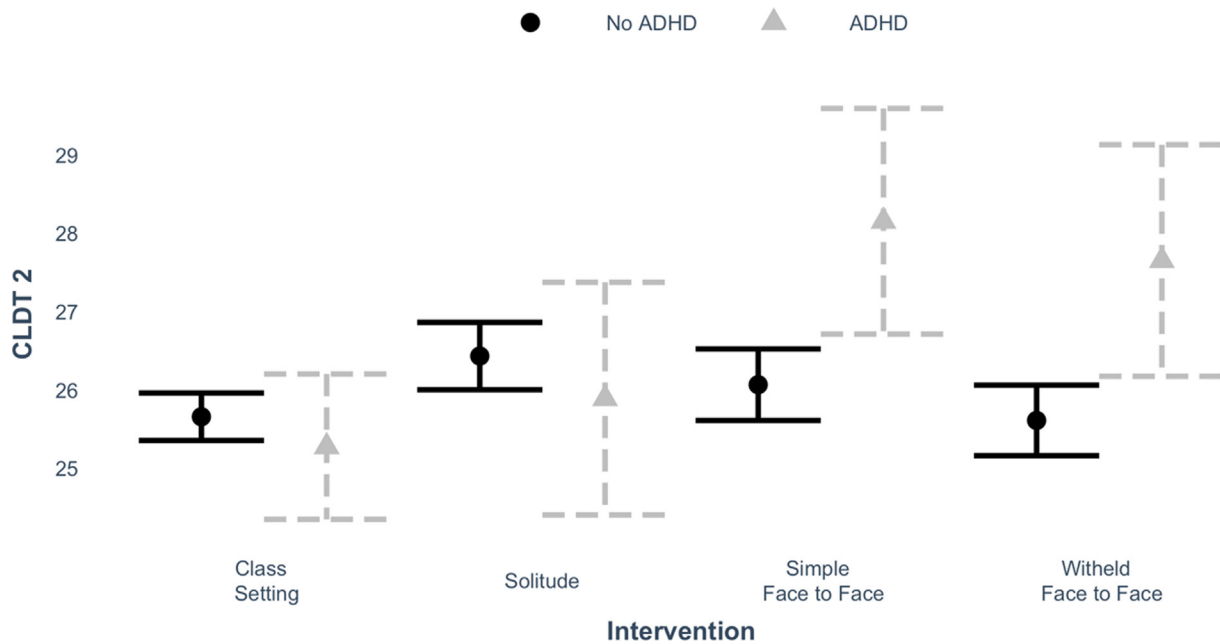


Fig. 1. Interactions between ADHD and Intervention conditions in predicting CLDT-2 scores. Error bars depict 95% confidence intervals.

leaders with ADHD succeed in their decision-making, and even exceed the performance of leaders without ADHD.

More specifically, making the decisions in a quiet isolated room improved performance irrespective of group. Further, two interventions that included a face-to-face encounter with an examiner had a positive impact on the decision-making of leaders with ADHD, compared to their decision quality in a classroom setting; and compared with leaders without ADHD. Both under the simple- and the withheld face-to-face interventions, leaders with ADHD performed better than the controls without ADHD. These findings correspond with recent research regarding children with ADHD showing a positive influence of the interaction with an examiner and the rapport created, generating opportunities for social feedback which improved executive functioning (Gidron, Sabag, Yarmolovsky, & Geva, 2020). These findings extend and strengthen the notion regarding the importance of the presence of a substantial meaningful other, also for adults with ADHD when performing leader's executive tasks. The mechanisms involved though are yet to be determined. Plausibly, the presence of a significant individual induces a beneficial atmosphere for leaders with ADHD, providing implicit social feedback, supporting a sense of being supervised and receiving validation, thereby increasing self-gathering and willingness to please and being positively appreciated, as opposed to the alienated context of the control classroom setting where there was no personal face-to-face interaction with the examiner, nor with other peers when solving the social problems.

The second intervention that promoted success, particularly for leaders with ADHD included a withheld response while responding face-to-face to the examiner. Along with the positive impact of engagement with an examiner, there was also an impact of delaying a response while engaging with an examiner in enabling the activation of the executive network to limit impulsive responses and elicit more optimal executive decisions. These findings are compatible and extend former research in other environmental contexts that utilize a response delay for improving the performance of individuals with ADHD (Colombo et al., 2017; Minder et al., 2018). Current findings extend this literature by pointing to the importance of a delay (in this case: a quick 12-second-long delay) to improve the leader's decisions in ways that may even serve to save lives later.

Importantly though, both the simple face-to-face intervention and the withheld intervention showed similar increases in performance among leaders with ADHD. This finding may indicate the greater influence of the face-to-face interaction that serves as a ceiling effect in both contexts. It seems that mainly the opportunity of engaging with another meaningful person with whom one has rapport, offering opportunities for implicit feedback, improves the decision-making of leaders with ADHD.

Practical implications

Current findings shed light on important interventions that lead to better decision-making of young leaders with ADHD. These interventions work parsimoniously, are easily implemented, and do not include any sophisticated auxiliary tools. The findings highlight that acting in a quiet isolated environment is beneficial for all leaders with and without ADHD. Regarding leaders with ADHD in particular, it is shown that the presence of another interacting person, who offers feedback during the cognitive process, as well as actively sustained reaction, promotes decision making. When observing the military field, it seems that these interventions may be applicable at times in simple ways- but further studies are needed to explore the efficacy of such contexts in real-life settings. Combat soldiers usually operate in cohesive teams (Siebold, 2007). Thus, making decisions in a face-to-face manner with a person with whom one has rapport and an opportunity for receiving direct one-on-one feedback is an implementable intervention that naturally takes place in various military situations, as commanders operate alongside their deputies. Additionally, although not applicable in all states, even in extreme conditions, a leader with ADHD may be trained to delay a response (if needed) for a marginal time of 12 s, based on the approximated time it takes to formulate a coherent sentence (Kempen & Maassen, 1977); to enable the passing of an interfering thought or enable second consideration in high-risk high-gain contexts when encountering a stressful context with another person. While current findings do not indicate improvement in the withheld condition on its own; given other effects seen in the current study and the theoretical considerations it may be fruitful to explore in future research withholding responses effects in social contexts other than the presence of a supervisor. Current findings suggest that when

leaders with ADHD implement simple techniques while exerting leader's decision-making, they can make more adaptable and cost-beneficial mental assessments that lead to better solutions and outcomes with vast implications, including scenarios related to the battlefield.

Moreover, the results strengthen the understanding that, despite skeptical voices, leaders with ADHD may succeed when given the appropriate conditions and trained to apply interventions that can be implemented even when considering combat events, like instructing leaders with ADHD to make leadership decisions while interacting with another individual when possible.

Given the efficacy of these interventions for leaders with ADHD, considerations may be warranted concerning the generalization of the findings to other domains of leadership. An array of occupations share characteristics with those of the combat roles, such as having to cope with stress and danger (Kellett, 2013). In medical fields, law enforcement, fire departments, and crisis response organizations, as well as occupations that are characterized by immediate high profitability and performance (Brandt et al., 2016) where extreme events are commonplace (Hannah et al., 2013). Importantly in this regard, apart from the military context, highly stimulating, stressful, and challenging work environments have been found desirable by individuals with ADHD, who report more success and satisfaction in such work placements (Lasky et al., 2016). Plausibly the current notions and findings may generalize to an array of high-risk high-gain occupations. Indeed, similar to the higher prevalence of ADHD in combat soldiers (Rosellini et al., 2015) compared to the general population of adults (Moffitt et al., 2015); there is a higher prevalence of ADHD in certain civilian environments with characteristics that attract more individuals with ADHD. For example, firefighters have more than four times the prevalence rate of ADHD compared to the general adult population (Phyllis et al., 2011), as well as elite athletes (Han et al., 2019)—placements that elicit traits that fit the occupational demands, along with the positive reinforcing and attentional activating effects of these occupations (Putukian et al., 2011). It may further be concluded that operating in a stressful civilian working environment may bear similar implications for managers and their decision-making (Albrecht, 2010), and potentially offer similar beneficial contexts as can be implemented in the military. Overall, we hypothesize that managers and leaders with ADHD in a wide array of civilian organizations may benefit from implementing these interventions, leading to major organizational impacts. Current findings lead the way for future research that has the potential to highlight optimal environments that both fit neurodiverse populations, as well as benefit from characteristics that leaders with ADHD have to offer.

Limitations and recommendations and future research directions

Despite the strong utility of situational judgments tests and their correlation with real-life circumstances (Cullen et al., 2020; Patterson, Lievens, Kerrin, Munro, & Irish, 2013), utilizing a paper-pencil SJT for assessing the decision-making of a combat leader may be remote from real-life situations, especially when relating to decision-making on the battlefield. Future studies are required to further examine these techniques in real-life situations and ensure generalizability to real-world scenarios. Moreover, given prior studies highlighting the multidimensional nature of SJT (Guenole et al., 2017; Lievens, 2017; McDaniel et al., 2016), it is important to investigate other aspects of the SJT's validity, such as other constructs that are measured, like interpersonal skills (Christian et al., 2010).

Additionally, in the current study, participants were provided information about the purpose, methods, and procedure they would undergo, and participated in front of an experimenter or beside peers while being evaluated in the army. The information and setting, while critical for transparency and setup design, could create bias and potentially lead to a demand effect, causing participants to adjust their

responses in the SJT to gain what they view as the desired result (Lonati et al., 2018). Continued follow-up and testing correlations of the CLDT with the commander's performance in the field may yield insight on this issue. Further, given the current research aim to concentrate on the face-to-face influence on leaders' decision-making, we deliberately applied a paper-pencil version of SJT and not a computerized one for enabling face-to-face direct unobstructed communication without a distracting screen barrier. While preferable in the current setup, this platform prevented us from examining a withheld condition in an isolation setting. Such a comparison is recommended in further research.

While there are of course differences between different organizations that engage in extreme contexts, it is important to explore these notions in contexts with similar patterns of dynamics that influence leadership through unique contingencies, constraints, and causation, to foster optimization of leadership performance in neuro-diverse candidates while limiting type-II errors and loosely generalizing theories that apply from one field to all others (Hannah et al., 2013).

Apart from the potential application to high-stress and high-stakes occupations, other important generalization aspects in the cohort of combat leaders in the Israeli army concern the over-representation of young adult males, which may narrow the current conclusions. The dynamics related to either of these components may affect leadership aspects (Anderson et al., 2017; Ayman & Korabik, 2010), like gender differences in leadership styles (Cuadrado et al., 2012) and age-related leadership dynamics (Rudolph et al., 2018) beyond any environment. However, similar to the higher prevalence of ADHD among high-stakes occupations, these placements also tend to have an uneven gender distribution, similar to that seen in the current study (Schafer et al., 2015). Given that the population dynamics in the current study are in line with other similar occupations, current findings may generalize to other high-risk high stakes settings, however it seems important to deepen the exploration of young female leaders with ADHD in high-risk roles.

Conclusion

This research has found different ways of improving the decision-making of combat leaders with ADHD. Specifically, likely due to executive dysfunctions that affect individuals with ADHD, face-to-face interventions that allow rapport and feedback from another individual are beneficial for this group. Understanding that certain handy interventions may ameliorate and improve the decision-making of combat leaders with ADHD, has crucial and far-reaching implications regarding the military organization and beyond. In addition, when given appropriate mediations, leaders with ADHD may function effectively, and even excel other leaders. This fact opens vast opportunities for the integration of leaders with ADHD inside the army, as well as outside, in civilian environments with stressful and extreme conditions.

Funding

This work was supported by the Ministry of Defense MAFAT research grant [grant number 4440706519].

Declaration of Competing Interest

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

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