Veteran Critical Theory as a Lens to Understand Veterans' Needs and Support on Social Media

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Veterans are a unique marginalized group facing multiple vulnerabilities. Current assessments of veteran needs and support largely come from first-person accounts guided by researchers' prompts. Social media platforms not only enable veterans to connect with each other, but also to self-disclose experiences and seek support. This paper addresses the gap in our understanding of veteran needs and their own support dynamics by examining self-initiated and ecologically-valid self-expressions. In particular, we adopt the Veteran Critical Theory (VCT) to conduct a computational study on the Reddit community of veterans. Using topic modeling, we find veteran-friendly gestures with good intentions might not be appreciated in the subreddit. By employing transfer learning methodologies, we find this community has more informational and emotional support behaviors than general online communities and a higher prevalence of informational support than emotional support. Lastly, an examination of support dynamics reveals some contrasts to previous scholarship in military culture and social media. We discover that positive language and author platform tenure have negative relations with posts receiving replies and replies getting votes, and that replies reflecting personal disclosures tend to get more votes. Through the lens of VCT, we discuss how online communities can help uncover veterans' needs and provide more effective social support.

CCS Concepts: • **Human-centered computing** → *Empirical studies in collaborative and social computing*; *Social media*; • **Applied computing** → *Psychology*.

Additional Key Words and Phrases: veteran, critical theory, online community, need discovery, community dynamic, social support, language analysis, topic modeling, Reddit

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1 INTRODUCTION

Veterans[1] are individuals who have served or completed a service to any branch of the armed forces [1]. Veterans are unique in that they undergo the experience of deconstructing and reconstructing civil identities [76]. They constitute a special group who face multiple vulnerabilities at once, including poorer health status [5, 19, 46], higher risk of mental health concerns [19, 37], and social reintegration difficulties [18, 43, 76]. A recent Pew survey found that near 60% of the veterans find it hard to re-adjust to civilian life, and about half the veteran population have had emotionally traumatic or distressing experiences [68]. However, as the core of military culture is built upon "hyper-masculine values," they tend to be reluctant in engaging with their emotions and seeking help [43, 76]. In fact, despite the availability of resources that are specifically dedicated to them, veterans perceive getting significantly less social support than civilians [17]. Social support is a multidimensional construct [98] providing varied psychological and material resources [22]. Therefore, we note a gap with respect to understanding veterans' needs across different dimensions, and subsequently designing tailored and proactive support strategies.

The literature shows that, as a community, veterans are a difficult to engage in research [36, 92], highlighting the need for systematic, scalable, and unobtrusive means to gather data on veteran perspectives, narratives, and life experiences. In recent times, social media platforms have become ubiquitous in our day-to-day lives, enabling individuals to connect with others and share life experiences. These platforms have design affordances, such as anonymity and selective audience, which help to encourage sensitive self-disclosure and support-seeking [8, 9, 29, 93]. This is especially important when these disclosures may conflict with maintaining positive impressions [91]. Social media has been shown as popular means among veterans [15] for connecting and supporting each other to overcome identity crises [92], seeking mental healthcare information, peer support [36], and assisting in military-to-civilian transitions [90].

Phillips and Lincoln have proposed the **Veteran Critical Theory (VCT)** which looks at the structures and systems that affect veterans through a critical lens. VCT is an adaptation of critical theory that aims to better understand the veteran population by challenging the perceptions largely held by civilians [74]. VCT, at its core, encourages ***"the voice of the veterans"***. However, gathering accurate and inclusive stories from veterans is challenging, considering the stigma in discussing personal feelings cast by the military culture [43]. Existing approaches may probe sensitive questions that can be too personal and uncomfortable to share or be emotionally triggering. This is also complicated by common health (e.g., traumatic brain injury) and psychological issues among veterans [36]. For instance, recalling traumatic experiences during interviews bears risks of immediate psychological distress [50]. Therefore, there is a need to complement existing intrusive and qualitative methodologies with passive and quantitative approaches that may reduce the emotional risks [31, 55] and potential biases [97] projected on veterans.

This study aims to address the challenges of accessing the veteran population and their stories non-intrusively at scale by examining an online veteran community (on Reddit). We analyze decade-long self-initiated and open-ended conversations in the community. Through a theory-driven approach, VCT motivates our research questions. First, reflecting on VCT's emphasis that **veterans should not be essentialized**, i.e., their concerns are not as simplified or similar as are often perceived to be, we investigate what are the *expressed needs* in the online community. Then, inspired by VCT's call to **include veterans in improving conventional practices**, we study *support behaviors* among veterans to provide empirical evidence towards future wellbeing resource development. Lastly, following VCT's view on **valuing narratives and counter-narratives**, we examine whether *community interactions* (reply behaviors and community reactions) align or

[1]This study primarily refers to and studies U.S. veterans [1].

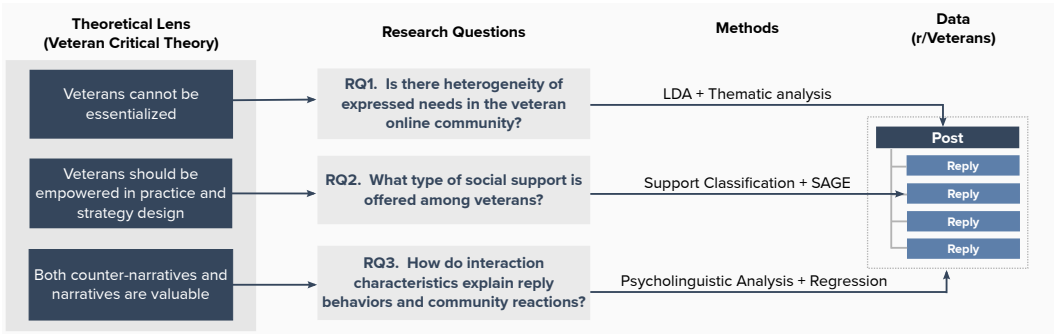


Fig. 1. A schematic figure explaining how the Veteran Critical Theory [74] drives our computational study on the Reddit community of *r/Veterans* to understand the needs and social support of veterans.

contrast with prior literature, as to better understand how to support the population in the future. We summarize our three research questions below:

RQ1: Is there heterogeneity of expressed needs in the online veteran community and what are the prevalent needs?
RQ2: What type of social support is provided among veterans?
RQ3: How do interaction characteristics explain reply behaviors and community reactions?

Our work draws on social computing and natural language research to examine a decade-long data of 16,507 posts and 146,779 replies on the Reddit community of *r/Veterans*, subscribed by over 66K members as of 2020. We first employ topic modeling followed by thematic analysis to obtain major thematically-relevant concerns. Then, we leverage transfer learning approaches to identify the supportive expressions into informational and emotional support. Finally, we evaluate how psycholinguistic and social factors of posts and replies are associated with reply behaviors and community reactions in the online veteran community. Fig. 1 describes shows our study.

Our study expands our understanding of veterans needs and support dynamics. First, *r/Veterans* has significantly more support behaviors than general communities. Informational support prevails greater than emotional support, indicating a greater appeal of practical support than sympathetic words among the community members. Second, we found that promotions of programs and events designed for veterans are poorly received in the subreddit. Contrary to prior findings in online communities [27, 93, 112], author platform tenure is negatively correlated with reply behaviors and community reactions. Contrasting previous literature on positivity bias [77] and military culture [43], we find that positive language is not preferred and replies reflect personal information and military values tend to get higher votes. Together, our work validates existing knowledge and provide unique insights about the veteran community, intending to provide empirical proof that policy assessments can use online communities as a complement to traditional self-reports.

This paper makes three major contributions: 1) We adopt a theory-driven approach to guide our analyses of veteran online communities and showcase the value and applicability of a critical theory to reflect on understandings of vulnerable populations; 2) We contribute to an ecologically valid understanding of veteran needs and support beyond conventional self-reported data; 3) We find linguistic markers with thematically meaningful topical needs, which can help future research and support programs to identify veteran subgroups that might otherwise be hard to reach.

Ethics, Disclosure, and Reflexivity. We recognize the sensitivity and ethical concerns in this study and include a self-reflective disclosure on our work. (a) As our data is publicly accessible from

Reddit, this work did not require institutional review board approval. However, we took careful attention in managing and presenting our data by removing personally identifiable information and paraphrasing content quoted as examples. Readers are cautioned that some example posts can be emotionally-triggering. (b) One of the authors has a military background that helps us frame and minimize inappropriate interpretations of the results. Our perspectives in this paper are shaped by her position as a female graduate student and a military logistics officer with 10 years of experience in the U.S. Army. (c) We clarify that our work is not intended to promote a certain type of topic framing or language choice, or to reinforce existing stereotypes and societal biases. The goal is to discuss potential alternatives to providing effective support. Despite our efforts, we acknowledge the potential ethical implications, which we further elaborate in the Discussion section.

2 BACKGROUND AND RELATED WORK

2.1 Veterans as a Vulnerable Population

Vulnerable populations are individuals at greater risk of "poor physical and social health status" [80]. Veterans are former members of the military, and compared to the dominant population, they face a plurality of challenges and are subject to a higher risk in physical, mental, and social concerns. Veterans are known to have poorer health status, more medical conditions, and more hospital admissions than the general population [5, 46]. According to the Centers for Disease Control and Prevention (CDC), veterans are more likely to develop chronic pain and diseases, such as diabetes and arthritis, hearing issue, and joint pain, than their non-veteran peers [19]. A similar disparity between veterans and civilians is also seen in mental health conditions: veterans are significantly more likely to diagnose with depression, anxiety, and suicide ideation [19, 37].

Military culture leaves lasting impacts after veterans reintegrate into civil society [18, 43, 76] and brings unique challenges such as identity crisis [111] and civil-military cultural gap [24]. According to the latest National Survey of Veterans, nearly 60% of veterans are not well-prepared to enter the civilian work environment and more than 70% of them feel the military does not give them enough time to prepare for such transitions [101]. Besides, military culture promotes warrior ethos and hyper-masculine behaviors such as refusing to accept defeat [76], keeping emotions and fears inside [43, 116], and managing stressors without outside help [43]. Since help-seeking behaviors are greatly impacted by masculine norms endorsement [4], veterans encounter several barriers and reluctance to seek help and support. Potential conflicts between cultural background and support-seeking behaviors makes veterans a unique a vulnerable population. Therefore, we are motivated to examine whether such conflicts are reflected in their community dynamics and whether reflections (if any) are different from previous findings in other populations.

Moreover, veterans perceive significantly less social support than civilians [17]. Research has shown a lack of perceived support to be the strongest predictor of post-traumatic stress disorder (PTSD) [16, 67] though veterans are found to be more than twice likely to be diagnosed with PTSD than others [100]. Considering that 31% of the veterans receive mental health or psychosocial diagnoses [88], this reveals a clear need to enhance social support and prevent worsening of distress and depression among the veteran population.

With the ubiquity and wide use of social media and online technologies, social support has also been transformed online [29, 48, 53]. Online communities provide information channels necessary in dealing with the prevalent help-seeking reluctance [44, 63]. Social media is known to assist the discovery of group norms [89] and promoting self-disclosure and support offering [114]. For the veteran population, CSCW and HCI have studied how social media can help veterans in managing identity crisis [92], educating and supporting each other on physical and mental health [36], transitioning into the civilian culture [34, 90], and providing personalized psychological assistance [11].

However, there are challenges in understanding the veteran population and the benefits of social support to them. Past literature has noted the difficulty of accessing veterans [36, 92]. Moreover, existing assessments on veteran needs and support mainly rely on self-reported data that is subject to sample bias [97], while extra considerations should be given to the ecological validity as military culture promotes strength and stoicism [43]. We aim to contribute to a comprehensive understanding of this population and extend prior literature by examining ecologically-valid online self-expressions and community support at scale.

2.2 Veteran Critical Theory as a Lens to Understand Veterans

Critical theory starts with the idea of human liberation [47] and has developed a branch of theories closely tied with social movements. The umbrella of critical theories provides "descriptive and normative bases" to question the social status quo [14]. There is no single definition of critical theory and researchers believe specificity might undermine the ultimate goal of reducing domination [14, 52]. In the context of the veteran population, Phillips and Lincoln studied the application of critical theory and introduced the **Veteran Critical Theory** (VCT) [74]. Although any application of critical theory has no unified set of beliefs or principles, VCT presents a number of tenets as a prologue to ignite conversations and as examples to help guide inquiry and critique [74]. In this study, we adopt the following tenets to guide our research questions and result interpretation:

- **Veterans experience multiple identities and cannot be essentialized.** Critical theories recognize the intersectional nature of people's identity [25]. Veterans are not a homogeneous group that shares similar needs and experiences (i.e., essentialized). Instead, they differ in age, class, educational level, gender, sexual orientation, marital status, and many more dimensions [49, 74]. In the context of military service, there are also diversities in their reasons to join the military [43], ranks and grades [76], specialization, deployment history, and combat experience. Therefore, we cannot essentialize their needs under civilian-constructed assumptions and develop blanket policies and programs [74].
- **Veterans should be empowered in policy and practice design and some veteran-friendly services are ultimately serving civilian interests.** The privilege will not address the needs of others unless there is "interest convergence" [12]. Currently, many policies and conclusions about veterans are made without empirical evidence [103]. Therefore, veterans should participate in policies and practices regarding themselves. Besides, close examination is needed for services and organizations advertised to serve veterans in order to see who is the real beneficiary [74].
- **Both narratives and counter-narratives from veterans are valuable.** Critical theories privilege the voice of the marginalized [74]. Their counter-narratives offer a chance to shatter complacency [32] and challenge the dominant perceptions [65]. Stories from the less-heard provide the context necessary for "understanding, feeling, and interpreting" [56]. Therefore, it is important to let veterans tell their own stories rather than been assumed or written by civilians, promoting our work to study their in-group discussions.

VCT has been utilized to understand the challenges of student veterans [62], examine military professional training programs [38], and investigate veterans' identity alignment and negotiation [45]. These works contribute to the transition from deficit-intrinsic assumptions into asset-based framework [62] and form a more comprehensive understanding of veterans' multifaceted identities. We build on prior scholarship by extending the dominating application in the student veteran subgroup into assessments of needs and supports in a more general context. To our knowledge, this is the first study that adopts VCT to understand veterans' challenges and support based on social media

data. Our work aims to provide empirical evidence for both support intervention strategies and social platform designs to cater to the uniqueness of this population.

2.3 Online Communities as a Source of Social Support

Research has emphasized the essential role of social support on health and well-being [23, 99, 107]. Social support is a multidimensional construct [98] that involves psychological and material resources [22]. Therefore, conceptualizing and measuring social support remains a topic of debate [23] and is of great importance in understanding its impact. With the advent and wide use of social media, online communities have proliferated as a source of social support [53]. They can effectively serve as a medium to facilitate social support, connectedness, and mutual understanding [41]. Social support in online communities, in the forms of replies and votes, is critical for both promoting sustained interaction and continuous involvement in online communities [57, 87, 112] and moderating psychological stress [79, 93]. Social media is shown to be popular among veterans [15] and more than half of veterans express willingness to access veteran-related information online [101]. Therefore, studying support offered in online communities would help shed light on how to offer effective support and promote a more supportive community.

Social Support Behavioral Code (SSBC) is a categorization framework proposed by Cutrona and Suhr that classifies support behaviors into subcategories [26]. This categorization schema receives significant recognition in assessing social support and has inspired a lot of work in analyzing social media and online support. Among SSBC subcategories, two support types have received the most theoretical and empirical attention in the study of social computing: **informational support** and **emotional support** [8, 30, 93, 112]. Informational support usually provides advice, information, or knowledge, whereas emotional support relates to encouragement, empathy, or care. These two categories of support have been utilized to understand the effects of social support language on vulnerable population communities such as mental health support groups [93] and cancer survivor network [113]. We believe these findings can be applied to other vulnerable groups including veterans because of common factors such as life stress, stigmatization, and privacy concerns that could impact their online help-seeking behaviors. However, as the recent study on LGBTQ+ individuals' stress presentations on online support groups poignantly pointed out [82], vulnerable groups have different cultural and historical backgrounds to their agonies which highlight the importance of context-specific theoretical approaches in analyzing their online support seeking behaviors. Therefore, we draw on the Veteran Critical Theory as the theoretical framework that highlights veterans' unique backgrounds and overlapping identities, which could impact their online support seeking behaviors [74]. Also, the veteran population is unique in that they face certain potential conflicts between multiple identities as they can belong to other marginalized groups at the same time [74]. Thus, we are motivated to study if such conflicts are reflected in their community dynamics and if the veteran community shares findings in previous literature in online communities for other marginalized groups.

Despite the growing scholarship in studying the role and use of online social support, widely used assessments of veteran social support scales are mainly limited to family, friends, and social infrastructures [105]. The lack of evaluating online support leads to a gap in understanding how social media provides support with respect to various needs and challenges within community members. Our research extends this scholarship in online social support by utilizing SSBC schema to examine support offering behaviors by veterans themselves in a semi-anonymous context.

3 DATA

Veteran Critical Theory acknowledges that veterans are being constructed by the"civilian pen" and stories told by veterans are of great value in verifying and rewriting what has been written about them [74]. Drawn from this perspective, we turn the lens into conversations happening *in the wild*.

Why Reddit? Past literature has noted veterans using social media to connect with each other, such as Reddit, Facebook, RallyPoint, Yik Yak, and GroupMe [34, 36, 78, 92, 95]. Public platform offers large dataset, which allows us to access a larger population and potentially subgroups that can be otherwise hard-to-reach. In contrast, although private chats might ease the self-disclosure pressure associated with a smaller audience, there are downsides such as the predominantly synchronous conversations, expectation for quick response, and context collapse [40]. Members in a small-size group tend to know each other well and can be under the pressure of impression management [91].

Reddit is a public platform with discussion boards, community-driven structure, and pseudo-anonymous posting support (such as no email required for registration, temporary throwaway account functionality). Reddit consists of varied communities, known as subreddits, that gather individuals with similarly themed interests and facilitate themed discussions. Prior work showed how Reddit helps users to cultivate a sense-of-belonging with their communities and to candidly self-disclose to fellow community members [8, 29]. Compared to other public platforms, the pseudo-anonymous feature of Reddit adds unique value in alleviating social stigma and broadcasting pressure. Prior research has found that despite Facebook being a popular social media platforms among veterans, it is regarded as an undesired place by veterans to seek help for emotional problems or suicidal thoughts [95]. Reddit, however, does not require using real names or promote building network based on existing offline social connections. Recent work has found that veterans regarded *r/Veterans* as a place free of stigmatization concerns to seek information and support [78]. As an open community, *r/Veterans* is not limited to specific purposes or topics. Our work also draws motivation from a body of prior work that showed how Reddit data effectively reveals community dynamics and support among college students [10, 81, 86], LGBTQ+ individuals [82], sexual abuse sufferers [7], and individuals undergoing life transitions [39].

Veterans' Online Community Data. Catering to the specific population of war veterans, the subreddit *r/Veterans* self-describes itself as "a place to support one another and help resolve any VA/Veterans related issues." This community has been active since 2009 and is subscribed by 66,223 members as of December 2020. It is a public community that welcomes veterans and near and dear ones of veterans. We used the Reddit APIs (PRAW [2] and PushShift [3]) to collect posts and replies in *r/Veterans* subreddit spanning over nine years between March 2011 and September 2020. This led to an initial data of 176,561 posts and replies. Next, we removed any post that had been removed or deleted by either the user or moderators to respect the privacy and avoid fractured original text. Our final dataset consists of 16,057 posts and 145,779 replies.

Control Data. As our study particularly focuses on understanding the veteran population while comparing it against the general population, we also collected a control dataset. We obtained a set of posts and replies on Reddit matched on duration and data size. We obtained this data from subreddits on the landing page of Reddit, such as *r/Aww*, *r/science*, *r/Movies*, etc which are subscribed by general Reddit userbase. A similar control data strategy has also been adopted in prior work [10, 81]. This data corresponds to 17,890 posts and 153,207 replies.

Table 1 summarizes the descriptive statistics of our Veterans and Control datasets. We find that the number of replies in *r/Veterans* is similar to but less volatile than Control Reddit threads, indicating that *r/Veterans* is a fairly active community.

Table 1. Number of replies and reply length in *r/Veterans* and Control subreddits.

	Veterans Data		Control Data	
Community measures	**Avg.**	**Std.**	**Avg.**	**Std.**
Replies to posts	7.6	12.6	10.5	85.4
Length of replies to posts	59.2	775.3	34.2	64.4
Replies to comments	0.5	0.7	0.5	1.3
Length of replies to comments	43.3	57.7	30.3	48.4

4 METHODS

4.1 RQ1: Performing Topic Modeling and Analyzing Themes

We started by examining the posts in *r/Veterans* to understand veterans' needs and challenges. Guided by *Veteran Critical Theory* (VCT), we adopted the view that veterans cannot be essentialized and built a topic model to test the heterogeneity of their needs. We followed VCT's emphasis on the voice of veterans and included example posts as the basis for understanding and interpretation.

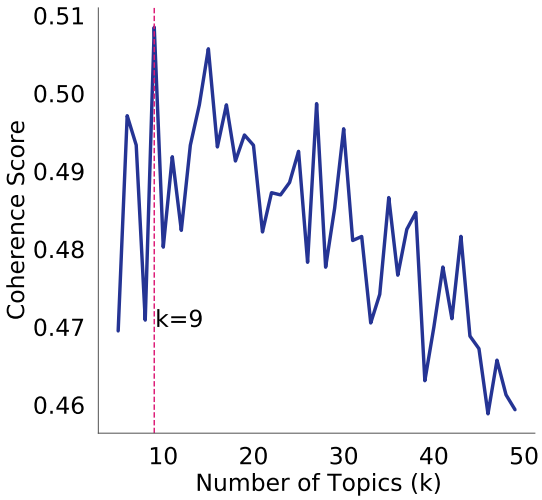
4.1.1 Building a Topic Model. To examine what individuals disclose online, we conducted topic modeling on our data. In particular, we employed Latent Dirichlet Allocation (LDA) [13], an unsupervised machine learning algorithm that is widely used for analyzing a corpus of documents to generate top latent topic distributions. This generative probabilistic model is useful to analyze large unlabeled document collections and cluster them into groups based on word similarity. Prior work has also used LDA to analyze social media and specific online group populations [20, 109].

Before feeding data into the topic model, we adopted standard data pre-processing and cleaning, including tokenizing, stop word removal, and lemmatization. We included n-grams (n=2,3) and converted our dataset into a bag-of-words. Given that the LDA algorithm does not determine the optimal number of topics, the number of topics needs to be explicitly provided. For this purpose, we took the coherence measure as a metric to evaluate model fit, and consequently the number of topics. The coherence metric measures how words within a topic tend to co-occur and has been demonstrated as a metric correlates with expert opinions of topic quality [61]. We calculated the coherence score for our pre-processed corpus by varying the number of topics (k) between 5 and 50. Fig. 2a shows the variation of coherence score, revealing the highest coherence score at k=9. Therefore, we used a k-topic (k=9) LDA model for the rest of our paper. Fig. 2b shows a graphical representation of the topics within our dataset.

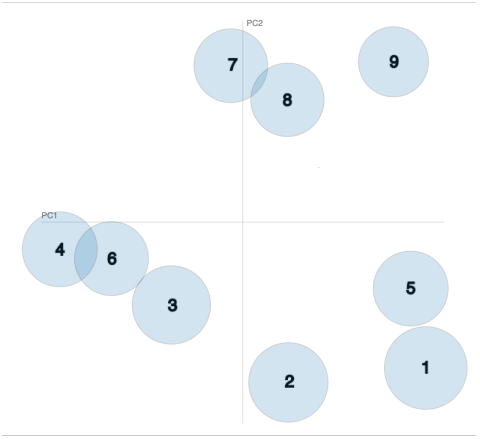
4.1.2 Thematically Analyzing the Topics. The LDA model resulted in a collection of clusters and frequent keywords. To assign meaningful and human-interpretable labels to these topic clusters, we followed a thematic analysis approach. This process was conducted by two authors who were familiar with the veteran population and had adequate knowledge of the literature in this space. The authors conducted an inductive coding, where they first independently coded the topics based on clusters of keywords while referring back to sample posts corresponding to each topic. Then, the authors compared and discussed their codes to gradually coalesce the codes in thematic labels.

4.2 RQ2: Classifying Support and Comparing Supportive Expressions

We then examined replies in the online community to investigate how and what type of support is offered in the online veteran community. Following VCT's call to include veterans in strategic design, we studied peer support to fill the gap between desired support and actual support strategies



(a) Coherence scores for LDA models (highest value observed at k=9).



(b) Inter-topic Distance Map (via multidimensional scaling) showing the topic distribution and overlap as per the k-topics (k=9) topic model.

Fig. 2. LDA Topic modeling in our dataset.

offered to veterans. Below, we explain how we classified replies into subcategories and compared support offering behaviors inside the veterans' community with the general user group.

4.2.1 Classifying Support Expressions. Social support is considered an essential component in helping people cope with psychological distress and life challenges [53]. With the advent of social media and online communities, social support has also been translated into online forms [29, 75]; in many ways, Reddit communities also function as online support groups. The Social Support Behavioral Code schema provides a framework to categorize support [26], among which two critical forms of supports are informational and emotional support. These two forms of supports have also received considerable empirical attention in social computing literature [8, 30, 93, 114]. Here, **informational support** refers to support related to advice, information, or knowledge, and **emotional support** refers to support offering encouragement, empathy, or care [26].

We assigned support types (if any) provided in each reply from both our Veterans (145K replies) and Control datasets (153K replies) by classifying support into informational and emotional support. We adopted a transfer learning approach, a technique where a machine learning classifier is built by transferring knowledge from one labeled dataset and appropriated on an unlabeled but similarly-sourced dataset [96]. We used labeled Reddit data with support labels of informational and emotional support from prior work [93]. Then, for each type of support, we built a supervised learning classifier using n-grams (n=1,2,3), replicating prior work [84]. Among the various classification algorithms, the SVM model performed the best with a mean Area Under Curve (AUC) of 0.82 for informational support and a mean AUC of 0.79 for emotional support (other classification details and metrics can be found in Saha and Sharma [84]). Fig. 3 shows the Receiver-Operating-Characteristic Area-Under-Curve (ROC-AUC) plot for our support classifiers.

To ensure the validity and applicability of the transfer-learning-based support classifiers on our dataset, we manually validated a random sample of 100 replies in our dataset. Two annotators

Table 2. Example paraphrased replies with labels of informational support (IS) and emotional support (ES).

Example Reply	IS	ES
Sorry if I misread this but sounds like you are thinking about quitting life. Please don't do that. We are here to help you get through whatever you're struggling with.		✓
Your school will help you prove you're full-time student. It's part of the program standards that they inform VA of your enrollment by weekly clock hours.	✓	
You are allowed to request another doctor that's patient advocacy. I suggest you check if that facility offers shuttle services or try finding a ride. Your travel expenses will be reimbursed. You can and should do everything possible to take care of your health. Wish you the best!	✓	✓
Can you post the video? I'm very curious to see it.		
Feel sorry that you are living my routine nightmare. Honestly, every month I dream of failing at life and having no choice but to reenlist.		✓

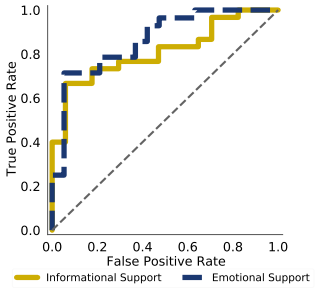


Fig. 3. ROC-AUC plot of the Support Classifiers.

independently labeled these replies with emotional and informational support. Any difference in agreement between the two annotators was determined by a third adjudicator. Finally, the manual labels were compared with the machine labels as per classifiers. This resulted in an F1 score of 0.78 for informational support (Sensitivity = 0.69, Precision = 0.88, Accuracy = 0.74) and F1 score of 0.71 for emotional support (Sensitivity = 0.87, Precision = 0.60, Accuracy = 0.79). We considered this performance to be acceptable and proceeded with our ensuing analysis. We note that in our classification approach, emotional support and informational support are not exclusive, meaning a reply can provide either of, both of, or neither of emotional and informational support. Table 2 shows example posts labeled with emotional and informational support in our dataset.

On the classified dataset, we examined the replies in correspondence with the topical themes that the original posts belonged to. This allowed us to understand how support-seeking needs vary across concerns and discussion themes. We compared our Veterans dataset with the Control dataset to examine differences in how support is provided in the veterans' online community with respect to other Reddit communities.

4.2.2 Classifying Support Expressions. We analyzed the language of supportive expressions to distinguish the salient linguistic expressions of informational and emotional support in the veterans' Reddit community. In particular, we conducted an unsupervised language modeling analysis called Sparse Additive Generative Model (SAGE) [35]. Given two documents, SAGE selects salient and distinct keywords for each document by comparing the parameters of two logistically-parameterized multinomial models using a self-tuned regularization parameter to control the tradeoff between frequent and rare terms [35]. This approach has been successfully applied to study salient linguistic differences within the context of prior social computing research [69, 70], including on Reddit data [21, 82, 93]. We conducted SAGE to identify distinct and salient n-grams (n=1,2,3) between the posts receiving informational support and those receiving emotional support. For each *n*-gram, SAGE returns a SAGE score where the magnitude of an *n*-gram's SAGE score signals the degree of its saliency, and in our case a negative SAGE score indicates the greater saliency of the *n*-gram in informational support and a positive saliency indicates a greater saliency in emotional support.

4.3 RQ3: Operationalizing Characteristics and Examining Support Dynamics

Our final goal concerns understanding support dynamics within veteran communities by studying reply behaviors and community reactions. VCT largely stresses the importance of veterans' narratives and counter-narratives. This leads us to consider inexpressible stories — the accepted norms and subconscious tendencies. Prior work has explored the preference towards positive language [77] and credible users [60, 84] on social media; however, whether the same inclination holds true for the veteran populations remains unknown. Understanding how post features are related to reply behaviors and how reply features explain community reactions can help shed light on ways to design technologies to offer more effective support. Therefore, we selected factors based on extant scholarship in psycholinguistics [72, 73], online community dynamics [27, 51, 112], social media expressions [83], and military culture [43, 110]. We operationalized a number of characteristics and examined if they bear a significant relationship with reply behaviors and community reactions through regression modeling. We explain the motivation and operationalization process below.

4.3.1 Operationalizing Characteristics. In online communities, multiple linguistic, structural, and social measures can potentially impact replies that a post receives or votes towards a certain reply. Below, we motivate, define, and operationalize our measures to explain community dynamics.

Topical Themes: Prior work reveals the role of content topics on the degree of interaction in online communities [39, 59]. The National Survey of Veterans shows a variance of needs among the veterans and their spouses [101]. Accordingly, we included the topical themes as covariates, since certain topics inherently bear lower significance to a smaller portion of veterans or their relatives.

Psycholinguistic Features: We employed the Linguistic Inquiry and Word Count (LIWC) text analysis tool that offers well-validated psycholinguistic lexicons [94], known to work well with short-texts and social media data [81]. Based on prior work, we examined the following categories:

- *Emotion* (positive, negative): Previous research has investigated the presence of "positivity bias" in social network sites where positive presentations are preferred to negative ones [77]. As the denial of stressful feelings is regarded as a psychological trait of veterans [43], we wanted to test whether this trait was reflected in their online discussions by including emotional words as covariates and specified negative words into anxiety, anger, and sad.
- *Military Culture* (affiliation, achievement, power, reward, risk): Military culture is known as a lasting and vital factor in shaping veterans' perspectives and behaviors with a preference towards discipline, order, and masculine presentation such as strength [36, 43]. However, it remains unknown if veterans' online interactions accord with the shared military values. We included this category as independent variables to understand the effect of military culture on self-initiated semi-anonymous conversations with their comrades.
- *Personal* (social, family, friend, home, death): One ingrained behavioral and psychological consideration in veteran life is privacy [110], which encourages separating work from home and produces a "psychological shutting off" characteristic among veterans [43]. Therefore, we included personal relationships as independent variables in the model to see whether this trait will be observed (or not) in the semi-anonymous context.
- *Health* (body, health): Physical and mental health is known as the most salient problem among the veteran population [106], which we included as independent variables in the model to test whether a more common need is related to interaction dynamics.
- *Reality* (work, leisure, money): Military-to-civilian transition is one of the major challenges of veterans [92], reflected by expressed needs for training and job assistance [115]. Based on this, we included reality concerns as covariates in our model to see whether this known challenge also draws attention in online settings.

Content Verbosity: Prior work has shown the impact of information overload on online group interactions where shorter messages are perceived as simpler and more likely to get responses [51]. Recent work shows that verbosity of responses exhibits causal links to effective support in online mental health communities [84]. Similarly, online conversational agents with verbosity are negatively associated with less likeability [108]. These findings motivated us to examine the role of verbosity in online veteran community. We defined verbosity as the number of words per post and included it as an independent variable.

Author Reputation: Previous research indicates that online community members tend to give more trust to individuals who appear with more credibility and reputation [60]. Research has shown greater interactivity is associated with increased user commitment and longer tenure [112] and better peer support and psychosocial outcomes [84]. We included author reputation as an independent variable and defined it based on two platform-wise measures: contribution and tenure. We quantified contributions based on a Reddit measure named user karma, which counts the total votes a user earned across Reddit (i.e., upvotes subtracted by downvotes) [21], and we calculated tenure as the number of days between the date users joined Reddit and the date of data collection [85].

4.3.2 Conducting Regression Analyses. We built linear regression models based on above features to test the correlation between linguistic and social characteristics and support dynamics in the community. Linear regression models are known to provide interpretable associations in conditionally monotone relationships with the outcome variable [28]. Therefore, in our case, these models would help us delineate the significant factors explaining reply behaviors and community reactions.

Reply Behaviors: To analyze the the correlation between post characteristics and reply behaviors, we built three logistic regression models with outcome variables ($\mathcal{R}$) of (1) the normalized number of replies, (2) the normalized number of informational support replies, and (3) the normalized number of emotional support replies (ref: Equation 1).

$$\mathcal{R} \sim TopicalThemes + PsycholinguisticCharacteristics + Verbosity + AuthorReputation \quad (1)$$

Community Reactions: To analyze the the correlation between reply characteristics and community reactions towards that support, we quantified reactions based on Reddit measure comment karma, which refers to the net vote between upvotes and downvotes that a reply earns. Similarly, we built three logistic regression models with outcome variables ($\mathcal{V}$) of (1) the normalized votes (comment karma), (2) the normalized votes for informational support replies, and (3) the normalized votes for emotional support replies (ref: Equation 2).

$$\mathcal{V} \sim PsycholinguisticCharacteristics + Verbosity + AuthorReputation \quad (2)$$

5 RESULTS

5.1 RQ1: Expressed Needs in Online Community

Table 3 summarizes the nine topics obtained via LDA modeling followed by thematic analysis. We consider these to be the major themes of needs and concerns expressed by veterans in the online community and discuss our findings with illustrative examples. First and foremost, the heterogeneity of discussed topics reveals the diverse needs among the veteran population. Therefore, as Veteran Critical Theory (VCT) suggested, considerations should be given to different veteran identities. Veterans should not be essentialized into a disciplined and patriotic [68] white male [66] that had combat experience. Rather, a veteran can be a student, a female, a minority, or someone with non-combat trauma. These various identities would result in unique needs.

The United States Department of Veterans Affairs (VA) is a federal agency that provides services and assistance to veterans and their families. Understandably, VA-related topics receive the most

Table 3. List of topics with example post snippets sorted by the frequency of occurrence. Topical frequency is computed as the percentage of posts on a topic across all posts. Topic ids are consistent with Fig. 2b.

Topic (ID)	Top Keywords	Freq.	%Replies
Publicity and Community Bonding (T_2)	veteran, link, war, support, story, group, share, soldier, country, serve, local, family, organization, care, resource, veterans_day, honor	28.4%	55.5% (4.2)
"Registration for the very first Veterans Parade in XX city is now open. Complete the online form and join on [mm/dd]."			
VA Support and Assistance (T_9)	va, claim, disability, rate, file, rating, receive, exam, submit, process, letter, question, appeal, request, send, deny, form, record, date, ptsd	10.7%	94.7% (8.3)
"I have PTSD rated at 40%, tinnitus at 10%, migraines at 40%. I have an active claim of PTSD under [a VA benefit program]. Can I apply for [another VA program]?"			
Educational Benefits and Opportunities (T_7)	school, pay, month, gi_bill, benefit, va, class, receive, start, question, bill, payment, cover, post, post_gi_bill, semester, money, back, credit, amount	10.5%	97.0% (9.4)
"New semester is about to start but my post-9/11 GI Bill has only four weeks left. Can I get my full tuition covered?"			
Self-disclosure (T_5)	people, life, feel, thing, friend, make, ptsd, lose, guy, f**k, time, talk, s**t, bad, feel_like, lot, hard, good, love, dont_know	9.9%	83.4% (11.8)
*"I feel like a b***h. The constant f***ing hyper vigilance is killing me. That non-stopping tension in my body to get prepared for a stab or something. It makes me feel scared and weak."*			
Health (T_6)	va, issue, doctor, appointment, pain, problem, care, medical, surgery, treatment, condition, mental_health, back, due, hospital, test, injury, put, diagnose, give	9.9%	89.7% (8.2)
"Can someone with experience of filling back claim look at my radiograph and see if I can get my scolosis problem rated?"			
Military and Veteran Life (T_4)	year, military, service, army, question, base, active_duty, navy, give, serve, join, find, discharge, leave, separate, dd, order, retire, reserve, general	8.9%	83.0% (9.2)
"Other sexual assault survivors who want to apply for national security positions: we can now answer no to [screening questionnaire]. This intends to encourage survivors to seek mental health help without impacting career path."			
Life, Financials, and Families (T_8)	work, job, good, find, live, home, move, advice, year, area, place, house, idea, wife, plan, great, start, lot, thing, option	8.5%	86.1% (9.0)
"I move to [state] this year. My wife and I always wanted to buy a house. Now our credit score is enough for a VA loan. Does anyone know the requirements of VA new construction loan here?"			
Research Participation Request (T_3)	program, post, need, experience, college, survey, online, information, state, complete, university, require, student, finish, question, plan, study, website, advance, provide	8.0%	85.6% (8.5)
"Veterans needed for technology-assisted anger problem treatment at [university]. Eligible participants will receive compensation when they complete the online study."			
Administrative Procedure (T_1)	call, day, time, make, give, back, long, happen, today, end, contact, hour, week, office, wait, put, send, talk, point, find	5.2%	79.5% (8.3)
"I live in [city] and recently missed a VA screening call. I tried called the [county] office many times but never be able to reach the corresponding personnel to finish my missing paperwork."			

discussion and support, revealing a need for more accessible approaches to support benefits to reach individuals. There are three topics having "*va*" as a frequent keyword: **Educational Benefits and Opportunities** (T_7), **VA Support and Assistance** (T_9), and **Health** (T_6). These discussions show the highest reply rates, and posts about educational benefits generally take the shortest time to receive the first reply (average time to reply is ~60% shorter than other categories). The high

prevalence of the topic on educational benefits also somewhat aligns with the national veteran survey which reveals that only 41% of the veterans understand their general benefits [64].

We also find a high prevalence of posts that express and share emotional feelings and personal narratives. These are characterized by emotional keywords such as *ptsd, lose, f**k, sh*t, bad, hard, good, love*. We notice that such discussions in **Self-disclosure** (T5) receive the highest average number of replies of 11.81 per post. Many of the posts seek help or advice for mental health struggles, such as *"Beeping makes me think of bomb, I can't even get near my kitchen."* We also see several expressions of avoidance in our sample posts, as one post expressed, *"I am depressed for a long time and I handled it by drinking to ignore them."* or *"I don't know if I have PTSD and I'm afraid to get it diagnosed."* These posts indicate stress and mental health struggles and align with past work about how social media is preferred by veterans to alleviate the stigma of mental health issues and the pressure of masculine culture [90, 92] while keeping problems private [34]. At the same time, we draw attention to VCT's emphasis on overlapping identities and remind that the cause of mental health challenges varies from people to people and is not limited to combat experience. For example, there are posts bringing up military sexual trauma, such as *"I am a victim of MST (military sexual trauma). I know I'm not the only one but I feel alone and there is nowhere for me to talk with people going through the same struggle."* and *"All these years I have been telling myself that you can't rape a guy. I can't really have been raped."*

A large number of promotions and community requests targeted at veterans exist in **Publicity and Community Bonding** (T_2) and **Research Participation Request** (T_3) topics. While these two topics occur significantly (T_2 has the greatest prevalence among all topics), both of them receive the least attention and replies. Nearly 50% of posts in T_2 do not receive a reply, and posts have the lowest average number of replies and the longest median time of 11 hours to receive the first response. One possibility for the low response rate to services that are targeted at veterans is that they fail to take the veteran's values into account. This scenario is described by one reply in this thread: *"I'm a veteran and for the recent five years I have been working in capacities helping homeless vets. There are many people try to assist veterans, but for many veterans, living in the streets is better than depending on strangers' compassion to meet basic needs or receiving help from non-profits."* This echoes VCT's call to include veterans in designing policies and services aimed at them; otherwise even veteran-friendly gestures with good intentions might not be appreciated.

Finally, we see discussions about military-to-civilian transitions in the topics of **Military and Veteran Life** (T_4) and **Life, Financials, and Families** (T_8). According to the National Survey of Veterans, life transition has been a significant challenge for veterans [64]. For example, one post states *"Before joining the army, I never understand what makes being a civilian that difficult that these brave people have to take the cowards way out. Now I finally realize first hand how hard it can be to come back from a military life."* This post shows the value of encouraging veterans to tell their stories. Statistics may inform civilians about how prevalent an issue is (e.g., suicide) among veterans, but stories provide a foundation to bridging the connection between veterans and non-veterans. Discussions in online community also support prior research about the role of social media in assisting military-to-civilian transitions [34], especially how such bottom-up "lively infrastructures" fill the deficiencies of formal infrastructures [92].

5.2 RQ2: Provided Support Among Veterans

5.2.1 Comparing Veterans and Control datasets. We find that the prevalence of both kinds of supports are higher in Veterans data compared to the Control data. Fig. 4 shows the prevalence of support in the Veterans and Control datasets. Out of all the posts in the Veterans data, 47% received informational support and 36% received emotional support. In contrast, within the Control data, 28% received informational support and 22% received emotional support. The occurrences of

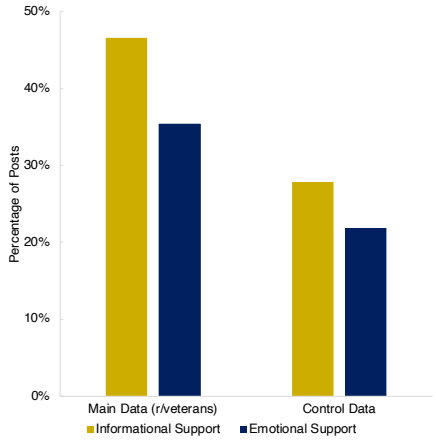


Fig. 4. Comparing the prevalence of support between Veterans and Control datasets.

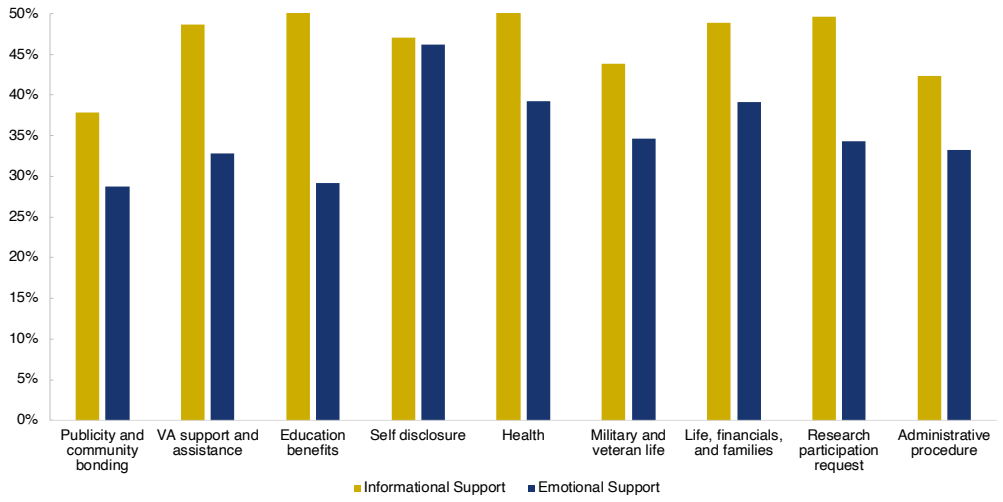


Fig. 5. Percentage of replies classified as emotional and information support in *r/Veterans*. **Informational support** provides advice, information, or knowledge, whereas **emotional support** is related to encouragement, empathy, or care. The classification of informational and emotional is not exclusive.

support in Veterans and Control datasets show a high effect size (Cohen's d) in both informational (d=0.40) and emotional (d=0.31) support. Independent sample t-tests reveal statistical significance for both informational (t=108.56, p<0.05) and emotional (t=83.83, p<0.05) support. The greater prevalence of support in Veterans dataset than Control subreddits explains that support-seeking and providing is indeed a core component of the *r/Veterans* subreddit. This also motivated us to further examine social support in this community.

5.2.2 In-depth Analysis of Support by Topical Themes of Discussion. We find that informational support occurs with greater prevalence than emotional support on average as well as across all topical themes. Fig. 5 shows the distribution of support across topical themes of discussions. The difference between informational and emotional support is the smallest in **Self-disclosure** (T_5)

Table 4. Top salient keywords in replies providing two kinds of support as per SAGE analysis [35]. Bar lengths indicate the magnitude of SAGE score; **negative values** indicate distinctness in **informational support**, and **positive values** indicate distinctness in **emotional support**.

Informational Support				Emotional Support			
Keyword	SAGE	Keyword	SAGE	Keyword	SAGE	Keyword	SAGE
missing payments	-5.64	voc	-0.54	sorry	0.80	felt	0.40
information posted	-3.60	rehab	-0.49	good luck	0.71	enjoy	0.40
gov gibill	-2.75	fees	-0.39	hear	0.59	appreciate	0.32
treasury	-1.92	financial	-0.37	thank	0.52	buddy	0.30
action performed	-1.89	benefit	-0.33	health care	0.52	wife	0.29
compose veterans	-1.89	va disability	-0.33	friends	0.51	family	0.29
case manager	-1.81	housing allowance	-0.30	hate	0.49	hurt	0.29
concerns	-1.22	stipend	-0.29	care	0.49	fellow	0.29
education benefits	-0.91	payment	-0.29	brother	0.48	health	0.29
regional office	-0.69	certification	-0.27	wish	0.45	guys	0.27
assistance	-0.65	eligible	-0.25	realize	0.41	suicide	0.26

which is likely because the replies to this kind of posts tend to contain both informational and emotional support simultaneously, e.g., *"I had a similar experience. After leaving the military, it took me five years to realize something was wrong. And trust me it's normal. I ended up getting anxiety disorder at 70%. I suggest you look into VA disability and set up an appointment as a first step. "* Considering the prevalent mental health issues among veterans [88] and the high suicide rate that about 22 veterans commit suicide every day [102], posts in this category should be given more attention and provide necessary resources when deemed as needed. Among the topics, **Health** (T_6) and **Education Benefits** (T_7) show the highest percentage of informational support, aligning with our findings in Section 5.1 and previous work [104]. Although education and healthcare are the major foci of the VA, existing programs need more assistance and clarification, as one post complained, *"I'm disabled, broken and homeless but still need to pay prescriptions that VA is supposed to cover. Called VA and all they give me is 'we will make an appointment for you'."* In addition, **Publicity and Community Bonding** (T_2) has the lowest informational and emotional support, which aligns with our findings in Section 5.1 that related posts receive the lowest reply rate and the least amount of replies. Together, our findings show that the promotions of organizations and events targeted at veterans are not well received, and that services that target veterans should involve veterans' voices in the design process. This would avoid developing procedures that are rooted in civilian-constructed false assumptions about veterans [42].

5.2.3 Analyzing the Language of Supportive Expressions. We examine the language of supportive expressions in this community. Table 4 shows the results of our SAGE analysis to distinguish the salient keywords associated with informational and emotional support. We find that informational support consists of keywords related to various kinds of documentation such as financial and cases, such as "missing payments", "treasury", and "case manager". Likewise, keywords related to political acts are prevalent in informational support, e.g., on "gov gibill", a reply was *"The current cap of GI bill for tuition payments is $18,077.50. Yellow Ribbon will cover any difference."* Informational support also corresponded to filing claims of benefits, like "education benefits", "assistance", "va disability", "benefit", as exemplified in the reply, *"to receive military retired pay instead of your VA disability comp, just submit a VA Form 21-651."* We find that the salient keywords under emotional support show lower magnitude of SAGE score, which indicates those same keywords also exist in replies containing informational support. Emotional supportive expressions saliently include positive and

Table 5. Reply Behaviors: Coefficients between post features and (a) number of replies, (b) number of informational supportive replies, and (c) number of emotional supportive replies. **Green** bars represent magnitude of **positive** coefficients and **Pink** bars represent magnitude of **negative** coefficients. (*** p<0.001, ** p<0.01, * p<0.05). Bar length and color indicate magnitude and sign of the regression coefficients.

Replies

Category	Coefficient	p
Topic: Health	3.076	***
Topic: Military	1.284	*
Social	0.116	***
Culture: Reward	0.078	*
Verbosity	0.008	***
Pos Emo	-0.070	***
Culture: Achieve	-0.081	*
Culture: Power	-0.096	***
Culture: Affiliation	-0.144	***
Personal: Death	-0.166	***
Personal: Family	-0.184	**
Auth Tenure	-0.893	***
Topic: Community	-2.149	***

Informational Support

Category	Coefficient	p
Culture: Achieve	0.028	*

Emotional Support

Category	Coefficient	p
Culture:Achieve	0.036	**

Table 6. Support Acceptance: Coefficients between reply features and (1) votes (comment karma), (2) votes of informational supportive replies, and (3) votes of emotional supportive replies. **Green** bars represent magnitude of **positive** coefficients and **Pink** bars represent magnitude of **negative** coefficients. (*** p<0.001, ** p<0.01, * p<0.05). Bar length and color indicate magnitude and sign of the regression coefficients.

Votes

Category	Coefficient	p
Auth Contribution	3.438	***
Personal: Death	0.075	***
Neg Emo: Anxiety	0.050	**
Personal: Home	0.046	**
Health: Body	0.041	***
Neg Emo: Anger	0.039	***
Personal: Religion	0.023	*
Personal: Family	0.022	*
Health	0.016	*
Culture: Affiliation	0.016	**
Culture: Power	0.012	**
Personal: Social	0.005	*
Pos Emo	-0.010	***
Auth Tenure	-0.539	***

Informational Reply Votes

Category	Coefficient	p
Auth Contribution	3.272	***
Personal: Death	0.209	***
Personal: Religion	0.129	*
Health: Body	0.119	***
Neg Emo: Anger	0.094	**
Neg Emo	0.064	**
Culture: Affiliation	0.041	**
Verbosity	0.001	*
Personal: Social	0.026	***
Personal: Friend	-0.072	**
Auth Tenure	-0.647	***

Emotional Reply Votes

Category	Coefficient	p
Auth Contribution	3.140	*
Personal: Death	0.219	***
Neg Emo: Anxiety	0.095	*
Neg Emo: Anger	0.091	**
Health: Body	0.070	**
Culture: Affiliation	0.030	*
Culture: Power	0.028	*
Personal: Social	0.026	***
Auth Tenure	-1.017	***

uplifting keywords such as “sorry”, “good luck”, “thank”, and “appreciate”, e.g., *“My shoulder was dislocated in service; I totally understand you. An appointment may not be perfect, rather, take the day off and go visit urgent care. Good luck.”* This category also saliently includes keywords expressing sense-of-belonging, such as “friends” and “brother”, e.g., *“You’ll be fine, take care brother.”*

5.3 RQ3: Factors that Explain Support Dynamics

Among the linguistic and user characteristics, statistically significant features are shown in Table 5 and Table 6. We present a summary of results and our interpretations below.

First, we find a rejection of positivity bias [77] for both reply behaviors and community reactions. We notice in *r/Veterans*, positive emotions tend to receive less attention and acceptance, while negative emotions (especially anxiety and anger) are welcomed. This could because certain negative feelings or experiences are shared within the community, which forms connectivity that helps with stress relief [54] by disclosing similar emotions: *"I feel you brother. The pain is real and valid."* or common frustrations: *"complaining to the patient advocate did not help. It's a complacent system."*

Second, we find conflicting results for expressions about the military culture and personal information: they are positively related to community reactions but negatively correlated with reply behaviors. Through a future examination of example messages, we find such language appears in many posts that are not offering meaningful information but rather calling attention on veteran friendly events (e.g. Memorial Day) or general appeals (e.g. help veterans' families). They frequently show up in posts of **Publicity and Community Bonding** (T_2), which has the lowest reply rate among all posts. As discussed above, T_2 mostly promotes organizations and events targeted at veterans and are not well received in the community. In contrast, replies with same type of language help in establishing connectivity. For example, military-related information is used to show identities: *"only people who have served would know the condescending nature of such nonsense,"* or to support reflections: *"military comes with connotations of discipline, hardworking, honor, but this is different from who you are. We need to reflect on our experiences and what we contributed, and translate for prospective employers."* Similarly, personal information in replies provides actual personal backgrounds, serving as a basis for affiliation, e.g. *"I started college after seven years of service. I was older than my cohort and life experience far beyond most of them."* This preference to personal information echoes prior findings that self-disclosure fosters intimacy development [33].

Surprisingly, author platform tenure was negatively correlated with both reply behaviors and community reactions. Author platform contribution, however, is positively related with acceptance towards replies. This result could also be related to the fact that the community is formed on a pre-existing sense-of-belonging, shared identity, and shared military culture acquired by the members. The latter may indicate that members value content more than identity on the platform.

6 DISCUSSION

This paper adopted the Veteran Critical Theory (VCT) to computationally study the expressed needs and support in a large and active online community of veterans on Reddit. First, we characterized the heterogeneity of veterans' needs. In general, topics related to government programs and benefits received the most discussion and support. We see significantly greater information support than emotional support, shedding light on veterans' practical needs and support-offering preferences. Our analyses support prior knowledge that self-disclosures assists with intimacy development [33], but also have contrasted with prior research in social media such as positivity bias [77] and trusted user preference [60]. Our results show that the community is not opponent against expressions involving personal information and military culture and that author platform tenure is negatively related with community reactions. Based on these findings, we discuss interpretations and implications.

6.1 Understanding Veterans Through the Lens of VCT

Previous work that adopted VCT places a heavy focus on the multifaceted and diverse nature of veterans' identities. Mobley et al. calls attention to the fact that identities are often invisible and meanings of identity are constructed in a personalized way [62]. Lechuga et al. critiques the trend of deficit-based narratives [58]. Fullerton et al. encourages respect for personal life trajectories and responsibilities and call for ways to raise awareness of existing resources and programs [38]. Hinton finds that sense of belongings of student veterans goes beyond university culture and that there is no one-time and once-and-for-all solution [45]. We extend the dominant application of

VCT from student veteran subgroup into a more general context. We also expand data sources beyond interviews and surveys into self-initiated online discussions. In doing so, we continue to promote an asset-based framework [62] and form a more comprehensive understanding of veterans' multifaceted identities. Our findings highlight the heterogeneity of veterans' needs and community dynamics: support offering behaviors differ based on different needs and support dynamics vary based on offered support. Below we elaborate on the interpretation of the results and present practical and design implications.

6.1.1 Acknowledging the Plurality of Needs. VCT holds the view that veterans experience multiple identities at once and thus cannot be essentialized [74]. Our findings mirror the diversity of veterans' needs and challenges. Among various challenges expressed in the veterans' online community, posts in **Self-disclosure** (T_5) expressed a greater need of urgent emotional help. These posts express emotional feelings and personal stories with mental-health related words frequently mentioned, for example, *"I cannot remember when is the last time I don't feel low energy and not depressed."*

In addition, we call for attention to the heterogeneity within each need. For example, PTSD is a known health issue among veterans, but the diverse causes are not well recognized. Prior research acknowledges that more attention is given to combat-PTSD while PTSD related to military sexual trauma is less discussed [36]. This is reflected in a comment about mental health, *"I cannot believe still so many people believe the only cause of PTSD is seeing someone die and all other reasons are frauds."* According to the U.S. Department of Veterans Affairs, military sexual trauma is a prevalent issue as 55% women and 38% men report having experienced sexual harassment in the military [100]. Recall findings in Section 5.1 that there are posts talk about military sexual trauma happened to both male and female, revealing a need to recognize the diversities within each issue. Together, this work motivates future research to build upon and underscore the intersectionality of veteran identities as well as the heterogeneity of their experiences and concerns.

6.1.2 Listening to Narratives and Counter-narratives. VCT emphasizes the value of having veterans share their stories [74]. It suggests that their voices provide the necessary context for understanding and interpreting their experiences [56, 74]. Our work not only looks and reflects on these self-expressed and self-initiated narratives of veterans on social media, but also allows out-group members to gain a better understanding of the challenges and realities faced by veterans. For instance, an individual expressed, *"My dad struggled a lot after leaving the [Marine] corps. I never understand why. Your words brought tears to my eyes. Reading it gets me to see what the struggle looks like and feel to some degree the pain it brings. It is astounding."* Similarly, veteran members self-disclose and express challenges to others within the community, which helps them to cope with struggles. We find replies mentioning the value of shared identities, *"It does feel good when you know you can share your views with people who understand you."* Therefore, we highlight that stories shared in social media can provide a basis for civilians to understand and relate, and that online communities work as a channel for veterans to connect with people who share similar experiences.

VCT promotes counter-narratives as a way to help and challenge dominant perceptions [74] and shatter presumptions [32]. We also find counter-narratives regarding the gap between actual needs and theory-based support strategies. We see a greater percentage of informational support than emotional support. Interestingly, this observation contrasts with online mental health communities where emotional support typically outweighs informational support [30, 84]. This reveals a unique finding about the veteran population: a de-facto need for information and guidance, especially on how to gather resources and leverage opportunities. The greater prevalence of informational support also indicates a greater appeal of practical help than sympathetic words. Families, clinicians, and society might have a restricted idea of what social support entails. We see many unreplied posts that host "Welcome Home Party" or "Veteran Parade" for veterans without realizing that this

type of attention might not always be appreciated. Better guidance on disability claims or easier access to mental health counseling can be more helpful in terms of actual benefits delivery.

6.1.3 Empowering Veteran in Policy and Services Design. VCT encourages involving veteran perspectives in designing policies and practices catering to support veterans [74]. We find topics related to the Department of Veterans Affairs (VA) received the most discussion and interaction. There are three topics having "va" as one of the most frequent keywords: VA support and assistance, education benefits, and health. This resonates with the fact that healthcare system and education and training assistance are two main long-term programs of VA. However, assistance workshops offered by VA have an overall attendance rate lower than 13% [101]. According to the latest report, the most prevalent reason for not using health and education benefits is the lack of awareness or knowledge [64], which shows a clear need for more accessible approaches that allow support benefits to reach individuals. Together, these facts show that social media data reflects the offline concerns of the veteran population which may otherwise be difficult to gather at scale. Although *r/Veterans* is not a place designed to connect veterans with policy-makers, researchers have called attention on the fact that very few studies "combine critical theories and empirical research in the context of social media" [6]. On one hand, social media builds new forms of participation and provides more accessible channels. VCT provides a toolkit for critical evaluation of systems that involve with veterans, which "ultimately shapes policy and procedure" [74]. On the other hand, we recognize limitations of the retrospective nature and indirect veteran involvement in online discussion analyses. We regard such approach as an empirical proof that policy assessments can use online communities as a complement to traditional self-reports, and that policy makers can expand the use of official social media accounts from information sharing into information gathering while taking privacy and potential stigma into consideration. We believe online discussions can be an efficacious way to gather feedback and help to guide tailored, timely, and efficacious policies and support strategies to address the compelling needs of veterans. We hope providing safe and accessible channels, combined with invitation of active participation, will become a first step towards more direct and voluntary involvements of veterans in policy design in the long run.

6.2 Practical and Design Implications

6.2.1 Needs Discovery and Social Support Implications. A systematic review of veteran needs assessment shows that current literature has an unbalanced geographic coverage towards predominantly metropolitan areas and states while data source mainly comes from self-reported surveys [104]. Concerns on the dependence on self-reported data have been raised as such data is affected by many factors such as length, accessibility, timing, and presence of incentives [97]. At the same time, widely accepted assessments of veteran social support scales are limited to family, friends, and social infrastructures [105] with online communities often missing from the discussion.

As a comparison, this study is grounded in an online community context that contains self-initiated natural discussions without geographical constraints. Despite the critical importance of incorporating veterans' voices in policy design, it is difficult to recruit veterans for study [36]. Social media, however, has been shown to provide access to otherwise hard-to-reach veteran subgroups [71]. Similarly in our study, we find that many self-disclosures choose to use throwaway accounts to cope with the concern of stigma and privacy. Two such examples are *"Throwaway because I am ashamed to say that it can be so hard to control my issues by myself."* or *"This is probably just going to be a huge whiny post but hey that's what throwaways are for."* Therefore, we regard online communities as a vital resource to voices that would otherwise remain silent.

A majority of veterans express willingness to access information or apply for benefits online [15, 64]. Prior work also has highlighted the interdependence among veterans and the value of peer-support systems [36]. To summarize, we see online channels as a bridge between the top-down design of support programs and bottom-up needs expressions. They provide geographically-varied and ecological-valid assessments of veterans' needs that can help offer guidance and suggestions in policy design and implementations. Healthy and supportive online communities can play a role in lowering information access costs and filling the gap between designing policy and delivering benefits. We hope to contribute to a more comprehensive understanding of veterans and promote the discussion of sociotechnical factors in social support among people who work with veterans.

6.2.2 Social Computing and Design Implications. This work conducted a deep dive into the veteran community behaviors that give rise to implications for online community design. To begin with, we find a numerous similar questions regarding existing programs and benefits. We also find significantly more information-providing behaviors in *r/Veterans*, revealing an unmet need for practical information and guidance. These observations suggest that social media platforms can provide more efficient community-level help through automated or semi-automated strategies of question-matching and question-grouping based on themes. Similarly, the online community could ask the members to self-report the topical theme of their concern drawing on the list of topics identified in our study, along with a free-text option, should they choose to use it. This can help the platform to semi-automatically redirect a member to already- or previously-answered similar question, and also help other community members to passively consume information that they require. This would also benefit the moderators in maintaining the relevance of community discussions.

We find that the veterans' online community is unique in the relationship between platform reputation and support dynamics. Contrary to typical expectations in other online communities (such as specialized mental health support groups) [84, 112], we find that author platform tenure has a negative impact on both posts receiving replies and replies receiving votes. This could be because this community is formed based on members' offline lived experiences, and individuals can be similarly equipped to help each other. As a result, content (i.e., contribution to the platform) plays a more vital role than seniority (i.e., time on the platform).

Our work identifies factors that contribute to receiving more support. This can be used to nudge stakeholders to provide relevant resources for veterans. While prior research emphasizes the role that privacy conservation and hyper-masculine behaviors plays among veterans [43], we find replies with negative language (such as anxiety) and self-disclosures are positively related to higher community votes. Therefore, when designing tools for veterans or conducting research about veterans, considerations should be given to both the community culture and the context: how can the design respect community norms.

VCT also points out that veteran-friendly services can be ultimately serving non-veteran interests [74]. Recall in our results, out-group promotions of organizations and events for veterans are poorly received. Previous research has criticized the lack of empirical evidence in many population assumptions [103], which is echoed in our finding that many actions were carried out with goodwill but were poorly received. At the same time, we also notice a risk of advertised veteran-friendly services being used as a bait to take advantage of veterans, as evidenced by a significant number of posts promoting unrecognized organizations. The latter shows a need for a more efficient moderation process. This is also reflected in the current community rules, where more than half emphasize restrictions on outside links, approval requirements for participation requests, and no promotions or institutional representation. While there have been improved efforts to discriminate between spam and legitimate programs, there still exists a need to recognize and respect veterans'

unique culture and characteristics to work appropriately and effectively with them. There is also the need to provide identity verification to authorized organizations or users, thus enabling online community members to distinguish between trustworthy information and scams.

Lastly, we note a concern in the current design of Reddit, which offers to sort content on — *new, hot, top*, and *rising*, where the latter three options are about promoting popular posts to get further attention. This design could lead to a tendency that once a post is ignored in the beginning several hours, it is likely to be overshadowed by other posts over time. We note that Reddit was not primarily designed as a medium for peer support. However, considering its community-centric nature, promoting only popular content may hurt non-entertainment-driven communities, such as *r/Veterans*. One design implication that we make is that, besides providing options to sort on recency and popularity, platforms may also provide options to group and sort posts on topical themes, so that individuals may engage on threads based on interests and needs as well.

6.3 Ethical and Privacy Implications

While we follow the best practice in utilizing social media data and include co-authors with military experience, our work is not without potential harm to the studied group. Therefore we include a reflective discussion to address these points.

This study is based on publicly accessible social media data. Although we removed personal identifiable information and paraphrased our examples, we acknowledge that our use of data might be in conflict with people's perception of anonymous social media platforms as a safe place to disclose. At the same, this topic modeling approach may be misused to identify people with certain interests as to cast targeted advertisements, which may be perceived to be privacy-intrusive. Our work can be (mis)-used to game the system by third-party stakeholders or companies acting on their own interests to "gain the attention" of the veterans, who may otherwise be willing to ignore such promotions (as also observed in our findings).

While the core value of critical theories is to challenge the social status quo, we recognize that our work may reinforce existing stereotypes and societal biases about veterans. Again, our topic modeling outcomes may be interpreted as a simplified reflection of expressed needs, which is against the very appeal of not essentializing or simplifying the veterans' needs. Our work does not provide a complete spectrum of veterans' needs, and only aims to glean and verify prevalent perspectives and draw attention to nuanced differences and existent counter-narratives. While our analyses reveal that certain characteristics of posts and replies bear a greater tendency in receiving attention and acceptance, our findings should not be interpreted in a prescriptive fashion. Rather, our work allows us to re-think questions about how to enhance attention towards posts that receive lower support. Finally, there is no definite line between narratives and counter-narratives or between dominant perspectives and marginalized voices, and our work is not an exception. While we discovered certain contrasts to current understanding, we also highlight counter-narratives in any study should not form a basis to silence future discussions.

6.4 Limitations and Future Work

Our study has limitations and some of these suggest future directions. Because our study focuses on one specific social media platform, the findings have risks of limited generalizability. While the anonymous nature of Reddit's open community may provide some advantages, it also has limitations compared to closed group chats that may provide more emotional safety. Further, we cannot make claims about representativeness of the online veteran community given that social media data comes with self-selection biases. While we acknowledge potential differences in identities and self-presentations between online and offline environments, the rapid growth and ubiquitous feature makes social media a vital source of social support and cannot be easily separated

from offline context. A major assumption in our work is that the members of the online veteran community are veterans or their near and dear ones, which may not necessarily be true. Future work can explore diverse member identities within a community. Similarly, we did not distinguish community-specific author reputation from Reddit-wise measures of tenure and contribution.

Another opportunity for future research is to differentiate received support and desired support. Our work presents empirical insights on the preference towards informational support than emotional support, but we acknowledge that received information might not meet the poster's need. We consider our work to be a form of a feasibility study. We expect it to motivate future studies that incorporate causal-inference methodologies as well as mixed-method approaches that draw deeper insights and test the efficacy of design interventions. In the long run, we hope our approach of including veterans in the process can be a first step of more direct involvements.

7 CONCLUSION

This paper adopted Veteran Critical Theory (VCT) as the theoretical framework to guide a computational study on the Reddit community of veterans(*r/Veterans*). It addressed the gap in the understanding of veterans needs and their support dynamics by examining self-initiated and ecologically-valid expressions from veterans. Using topic modeling, we discovered the heterogeneity of veterans' needs and found veteran-friendly gestures with good intentions might not be appreciated. Next, we applied a transfer learning methodology and found significantly more support behaviors in *r/Veterans* than general online communities. We also witnessed a higher prevalence of information support than emotional support offered by veterans themselves. Lastly, based on extant literature, we identified some features to test the relationship between characteristics of posts and replies and interaction dynamics and found some contrasts to previous scholarship in social media about positivity bias [77]. We discussed how VCT can guide a better understanding towards both the veteran population as well as policy and practice designed for them, which helps to bridge the gap between the civilian and the veteran worlds. This research offers insights into the utilization of online communities in discovering the needs of vulnerable groups and the design for more effective social support.

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