

Basic Psychological Need Fulfillment in AI-Mediated Communication: A Case for Self-Determination Theory Application in NLP

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Abstract

According to Self-Determination Theory, human well-being depends on the ability of each person's environment to support their basic psychological needs (BPNs) for autonomy, competence, and relatedness. The rise of AI and its permeation into human communication increasingly make AI part of that environment. So far, limited work in NLP has leveraged Self-Determination Theory and the concept of BPNs. In this work, we argue that Self-Determination Theory poses a promising framework to extract the antecedents of human well-being from text by considering its commonalities with previously employed emotion theories and by reviewing the surrounding literature. In addition, we argue for AI-mediated communication as a target domain, given the centrality of relationships for BPN satisfaction and the possibility of shaping the field through targeted LLM development. We then outline ten challenges on the path to need-aware, AI-augmented communication.

Introduction

Self-Determination Theory (SDT) is an empirically grounded psychological theory that has been leveraged in a variety of domains (Ryan and Deci 2017). Consisting of various mini-theories, at its core, it posits the existence of three basic psychological needs: The needs for *autonomy*, *relatedness*, and *competency*. These needs have been shown to hold across demographics and cultures (Tay and Diener 2011; Chen et al. 2015) and by definition directly affect a person's well-being (Ryan and Deci 2017): When thwarted, they negatively impact well-being, while when fulfilled, they enable a host of positive experiences, ranging from higher vitality to greater relationship satisfaction. Crucially, one can not fulfill one's own basic psychological needs. Instead, we depend on our environment to *support* our BPNs. Just as we can not satisfy a physical need like hunger in an environment that does not provide food, we can not fulfill our need for relatedness in a context that offers no others to relate to meaningfully. An environment that does help fulfill our needs is therefore often called *need-supportive*.

As Large Language Models (LLMs) are increasingly becoming part of our everyday and work lives, they also

increasingly become part of the environment that - ideally - supports our basic psychological needs. On a global scale, this introduction into our environment happens in two ways (Sundar and Lee 2022). On the one hand, we may choose to directly interact with them, for example, by prompting chatbots. These direct interactions are the subject of the field of Human-AI-Interaction, where SDT and the concept of need satisfaction have already received considerable attention (Ozmen Garibay et al. 2023; Calvo et al. 2020; Nguyen and Sidorova 2018; Xia et al. 2023). On the other hand, AI may be integrated into our online communication. This happens when we or our communication partners turn to AI to compose a message, change the tone of an email, or click on one of the suggested replies a messenger may provide. In this case, the perspective shifts to the effects of LLMs in the broader context of communication and interpersonal relationships. This is the topic of study within the field of AI-Mediated Communication (AIMC) (Hancock, Naaman, and Levy 2020), which emerged from the broader field of Computer-Mediated Communication (CMC) (Walther 2011). In these fields of study, SDT has rarely been used as a framework to analyze the effects of the changing environment, despite its central role in relationship satisfaction (Deci and Ryan 2014). Similarly, the cross-section of Natural Language Processing (NLP) Self-Determination Theory also remains largely unexplored.

SDT's proposal of clear dimensions of hidden, psychological states is not unlike various theories of emotion, which have formed the basis of a substantial amount of research in the field of emotion analysis (Bostan and Klinger 2018). Emotion analysis is a subfield of NLP focused on the extraction of emotional content from text. Assuming that people communicate their needs to their conversational partners, whom they rely on to support their fulfillment, similar methods may be applicable to predict BPN satisfaction. Given their impact on human well-being and the growing entanglement of LLMs in human-to-human communication, we need a stronger understanding of how BPNs are communicated, detectable, and supported. In this work, we describe possible steps toward this goal, borrowing from the related field of emotion analysis. We also outline ten goals toward understanding how BPN fulfillment is communicated, how it may be detected, and how this detection could help in shaping the

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LLMs that define the AI in AI-Mediated Communication in a human well-being-centered way.

Motivation

Why SDT? The Effects of Basic Psychological Needs Fulfillment

Self-determination theory can be classified as a theory of eudaimonic well-being (Ryan and Deci 2001, 2017). In contrast with hedonic well-being, which centers around short-term pleasure, it is concerned with sustainable, long-term wellness, and includes concepts like meaning and personal growth. According to SDT, the precondition for well-being is the fulfillment of our three basic psychological needs: *competence*, or the need for mastery and excellence, *relatedness*, meaning the need for authentic connection, and *autonomy*, describing the need for volition in one's actions (Ryan and Deci 2017). To fulfill these needs, we are reliant on the support of our environment. This support may come in the form of a friend we can talk to about our problems (relatedness), a challenging task at work that we successfully complete (competence), or the freedom to choose said task or friend of our own volition (autonomy). In short, the three BPNs offer a simple framework for the necessary preconditions on well-being. More tangibly, studies have provided ample evidence for various effects that enable human thriving. Their core findings have been divided into mini-theories.

For example, BPN support has proven beneficial to outcomes in domains ranging from sports (Gagné, Ryan, and Bargmann 2003; Mouratidis, Lens, and Vansteenkiste 2010), over work (Baard, Deci, and Ryan 2004; Autin et al. 2022), Human-Computer-Interaction, (Peters, Calvo, and Ryan 2018; Tyack and Mekler 2020), to education (Guay 2022; Goldman, Goodboy, and Weber 2017) and beyond. BPN fulfillment can also help explain day-to-day variations in emotional well-being (Ryan, Bernstein, and Brown 2010; Reis et al. 2000). Feeling understood and appreciated, as well as having meaningful conversations, have been found to be particularly meaningful interactions for the fulfillment of the need for relatedness (Reis et al. 2000). However, from an SDT perspective, the fulfillment of all three BPNs within relationships is a necessary condition for their flourishing (Deci and Ryan 2014; Patrick et al. 2007), for example, by affecting our attachment to the people in our life (La Guardia et al. 2000). Once meaningful relationships are established, BPN satisfaction has been shown to mediate the relationship between friendship and life happiness (Demir and Özdemir 2010). Hence, basic psychological need fulfillment is a precursor to our overall well-being, with relationships being one crucial domain through which we receive need support.

Why AIMC? Need Support in Computer- and AI-Mediated Communication

Computer-mediated communication studies the effects of the introduction of technology in communication (Walther 2011). Some studies within this field have asserted that online communication can generally support BPNs. For

example, users' attitudes toward online relationship formation (Ang et al. 2015) and self-disclosure (Ang et al. 2014, 2015; Ang 2020) in online friendships have been shown to have a positive effect on BPN satisfaction in online friendships. Crucially, Ang et al. (2015) also found a link between BPN satisfaction in online friendships and overall life satisfaction, pointing out the key role of need support. In addition, BPN satisfaction in online friendships was found to be particularly high for adolescents who felt lonely, when compared to their non-lonely peers (Ang 2020), establishing the benefits of online communication for vulnerable groups. (Stehr 2021) showed that giving support online fulfills BPNs more than receiving it. A later study revealed that those effects were mediated by the autonomous motivation to give support and the positive feedback received for it (Stehr 2023).

AI-mediated communication (AIMC) is a subfield of CMC, which focuses on the effects of introducing AI to generate or change messages (Hancock, Naaman, and Levy 2020). Given the rise of easy-to-use LLM-based applications, such as ChatGPT, and the overall prevalence of digital communication (Anandavel et al. 2024; eMarketer 2021), it is pivotal to understand the possible impacts on a personal and relationship level. From an SDT perspective, the LLMs we use to communicate with others, or that others use to communicate with us, are becoming part of the environment that we rely on for need support. This warrants a deeper look at how need support is impacted by these changes. For example, we know that self-disclosure and giving support can fulfill our psychological needs in a computer-mediated setting. However, the introduction of AI may impact our self-disclosure (Hancock, Naaman, and Levy 2020). In the latter case, the involvement of AI on our conversation partner's side may strip us of the feeling of being able to help, or result in fewer conversational opportunities to offer help. Effects like these may help further explain prior findings that show a negative impact on relationship perception (Liu, Kang, and Wei 2024; Hohenstein et al. 2023) when the other party was known or suspected to have used AI in communication. In addition, participants in a one-week diary study reported concerns about overrelying on AI for communication in the long term (Fu et al. 2024). Beyond possible negative effects, participants in one study reported that the positivity bias of recommended responses led to them starting to formulate more positive messages themselves (Hohenstein et al. 2023). Therefore, identifying and including BPN-supporting communication patterns may not only help make AI-augmented communication more meaningful, but it may also serve as a teaching tool for BPN-supportive interactions. This may bridge the gap between the generally positive perceptions of AI-augmented communication and the negative perceptions that arise once AI involvement is suspected (Hohenstein et al. 2023; Liu, Kang, and Wei 2024). Yet, so far, the effects of AI integration in communication on BPN support remain uninvestigated.

Situating SDT in the NLP Landscape

Self-Determination Theory and NLP

Alharthi et al. (2017) built an annotated dataset on tweets, including labels of present BPNs, their fulfillment, and their social environment. They first filter eligible tweets by focusing on the connection between need fulfillment and emotion, choosing emotional tweets for further labeling. Through expert annotation, they then choose the most relevant BPN before again turning to the associated emotions to determine their satisfaction. They achieved high inter-annotator scores (Fleiss' kappa = .819) when annotating for the most applicable BPN, demonstrating the overall feasibility of creating corpora annotated for BPNs. They later used that dataset to train and evaluate various models to detect and classify BPNs and their satisfaction and to analyze need presence and satisfaction during a crisis (Alharthi, Guthier, and El Saddik 2018) and other events (Alharthi and El Saddik 2020). Their work also served as a basis to analyze BPN fulfillment of local citizens during the COVID-19 pandemic (Long, Alharthi, and Saddik 2020). Stajner et al. (2021) trained other models for the BPN type classification task and re-annotated parts of the dataset with the possibility of multi-class labels that could describe the presence of more than one of the three BPNs. When modelled as a ternary task, their models performed almost on par with the human annotator.

On top of that, Self-Determination Theory has been used as a framework for linguistic analysis in other instances. For example, one mini-theory within SDT served as the basis for the linguistic analysis of disinformation on social media (Khattar and Das 2024). In the context of well-being, Wu et al. (2017) considered the antecedents of emotions, drawing on frameworks like BPN satisfaction and appraisal theory. They draw on a private corpus containing written reactions, including happiness ratings to events at two points in time (current and reflective), and identify patterns related to various need expressions. They point out that some antecedents are not accounted for in linguistic resources. As examples, they list the concepts of obligation and incompetence, which are positioned as the lack of autonomy and competence, and hence, unfulfilled BPNs.

Two commonalities stand out among these works. For one, they can all be positioned in the field of CMC, albeit on community level rather than in one-on-one communication (Fawkes and Gregory 2000). The second is their close relationship to emotion, both in content and methodology. Stajner et al. (2021) argued that by drawing on emotions to annotate BPN satisfaction, the annotations became similar to sentiment polarity annotations. This leaves open the question to what extent BPN (dis-)satisfaction expression is equivalent to sentiment expression or, in other words, if previous work modelled and detected a different and related concept, rather than BPN satisfaction.

The Connections Between Emotions and SDT

There is a broad body of work connecting emotions and BPN satisfaction. For example, Sheldon et al. (2001) and Sheldon and Bettencourt (2002) found significant correlations between positive affect and BPN fulfillment. Effects for negative affect prevention were less pronounced. Similar results were obtained when analyzing the correlation between affect and need satisfaction in the context of UX, where the needs for competence and relatedness were especially influential (Hassenzahl, Diefenbach, and Göritz 2010). Furthermore, one mini-theory within SDT, which focuses on qualitative differences between several types of extrinsic motivation and intrinsic motivation, defines the latter specifically via affect. It describes intrinsic motivation as being characterised by the enjoyment an individual derives from an activity (Ryan and Deci 2017). Developing this model, Ryan and Connell (1989) stated: “[...] observations are the primary data for making inferences about the motives and autonomy of others. Lacking direct access to the internal states of others, interpersonal perceivers rely more heavily on the absence or presence of environmental factors and their correlation with action”. This concept is not only reminiscent of emotion analysis overall - a field targeting the extraction of internal, emotional states from text - but also closely mirrors a class of emotion theories called appraisal theories. Appraisal theories posit that emotions are dependent on the cognitive evaluations (appraisals) of events along several dimensions (Scherer, Schorr, and Johnstone 2001; Roseman and Smith 2001). These theories have already been used as a framework for emotion analysis, and multiple corpora have been constructed using third-party annotations (Hofmann et al. 2020; Hofmann, Troiano, and Klinger 2021; Casel, Heindl, and Klinger 2021; Stranisci et al. 2022; Troiano, Oberländer, and Klinger 2023; Wemmer, Labat, and Klinger 2024), which similarly rely on annotators' interpretations of event descriptions. Given the structural similarity of the models, which consist of multiple dimensions describing internal states that may impact other emotional constructs, methodologies derived for appraisal theories likely pose a good starting point for further research centered around Self-Determination Theory.

Open Challenges and Questions

Understanding Need Communication and Annotation Possibilities

While high inter-annotator scores are hard to achieve for emotion annotations (Troiano, Padó, and Klinger 2021), the concept of third-party annotation relies on the established notion that emotions are both expressed (Keltner et al. 2019) and interpretable by others (Realo et al. 2003). For SDT and BPNs, this basis still needs to be established. Suitable methodology could be adapted from prior work in emotion analysis. For example, gathering self-reports and comparing self- and third-party-annotation akin to Troiano, Oberländer, and Klinger (2023) may not only help uncover patterns beyond affect that reveal need (dis-)satisfaction, but could also

help gauge the viability of third-party annotations in judging it. Gathering annotations for related concepts, like affect, could help identify what other concepts annotators may look for and rely on. Stimulus labeling (Ghazi, Inkpen, and Szpakowicz 2015) could help understand what annotators consider when judging BPN fulfillment. The high inter-annotator scores achieved by Alharthi et al. (2017) when annotating for one relevant BPN suggest that texts contain some clues that allow annotators to infer the most relevant need from a text. However, what those clues are remains currently unclear. Beyond that, the previously employed method of expert annotation for gathering a BPN corpus generally leads to higher agreement but demands more time and potentially more financial resources. To lower the cost, many emotion corpora have been gathered through crowdsourcing. Inter-annotator agreement in this context depends on a multitude of factors, such as task wording (Mohammad and Turney 2013). Even though emotions are subjective, annotators generally have an idea of concepts like *joy*. They may not, however, have a concept of *relatedness*, *competence*, or *autonomy* in the sense of SDT, which also lack a clear definition (Lintunen et al. 2024). Therefore, it remains open if, how, and how well BPNs can be annotated through crowdsourcing.

- **C1:** How do individuals communicate need (dis-)satisfaction? Are there identifiable patterns related to need (dis-)satisfaction?
- **C2:** To what extent are third-party annotators able to pick up on those cues? To what degree do third-party annotations capture BPN (dis-)satisfaction as opposed to their outcomes?
- **C3:** To what extent can non-experts annotate for BPNs? How do guidelines need to be formulated for annotations to best approximate first-person annotations?

In addition, all three needs are present at any given time. Therefore, it is also relevant to understand how inter-annotator scores are impacted when the annotation tasks are made more complicated by allowing multiple annotations. As argued before, the annotation of BPN fulfillment was previously tied to the affect expressed in a text. This was possible due to the selection of one main need for each text, yielding a one-to-one match of affect to need fulfillment. However, when annotating for the fulfillment of more than one need, this ratio breaks down as annotations become more complex. Once BPN fulfillment annotations are disambiguated from related concepts, additional experiments into modeling BPNs and their fulfillment will help in developing appropriate models. Given the domain dependency of annotations that has been established for emotions (Buechel and Hahn 2016), it is crucial to understand to what degree BPN expression changes between domains. For example, need expression on the previously investigated microblog platform may be different than in one-on-one communication with trusted others or professional contexts.

- **C4:** How do annotators perform given the more complex task of multi-need annotation?

- **C5:** How (well) can multi-need recognition and (dis-)satisfaction estimation be modelled?
- **C6:** (How well) Does need expression generalize over different contexts and domains?

Investigating the Effects of AI-Mediated Communication on BPN Satisfaction

So far, all studies on BPN support in Computer-Mediated Communication have been conducted without a particular focus on AI. However, through its introduction into communication, the AI becomes part of the need-supporting or thwarting environment and may impact BPN satisfaction. Motivated by the negative effects on relationship perception when the communication partner was suspected to have used AI, we are currently conducting a study to better understand the role of BPN support on these effects.

- **C7:** How and when does the AI use of a communication partner affect a person's BPN fulfillment?

To tackle this, we are currently conducting an interview study to better gauge the context and possible mediating factors that may influence BPN satisfaction. While previous research has uncovered some relevant factors, such as prior disclosure of AI usage (Purcell et al. 2024) and the other party's perceived invested effort (Liu, Kang, and Wei 2024), there is currently no comprehensive understanding of the contextual facets which mediate the relationship between a conversation partner's AI usage and personal BPN fulfillment. Once we have gathered a qualitative overview of the involved factors, we plan to quantify those effects by conducting a vignette study to model the connections between the uncovered factors. Beyond this, previous research showed that supporting others also fulfills BPNs. Therefore, using AI to generate or augment messages may also disrupt the sender's need fulfillment.

- **C8:** How and when does a person's AI use affect one's own BPN fulfillment?

In addition, once BPN fulfillment can be automatically detected from text interchanges, we can leverage that knowledge to investigate communication patterns that lead to heightened need satisfaction for both communication partners. These can then be integrated into communication-focused AI tools to assess their effect on BPN satisfaction. Parallel to the findings, in which a positive AI message led to more positive self-written messages, such a tool can be used to study whether it helps users improve BPN-supportive communication behavior.

- **C9:** (How) Can communication-augmenting AI support users' BPNs?
- **C10:** (How) Does using BPN-aware, communication-augmenting AI affect one's communication patterns?

Discussion

While Self-Determination Theory has a broad empirical basis, it has not received much attention in NLP overall. This holds despite its structural similarity to other, more broadly applied theories, such as appraisal theories, which

already provide us with possibly transferable methodology and frameworks. In addition, while first findings show that need satisfaction is possible through computer-mediated communication, the effects of AI introduction in communication on BPN support remain unclear. As a consequence, the cross-section of NLP, AI-Mediated Communication, and Self-Determination Theory remains uninvestigated. Yet, in the wake of LLM integration into our daily conversations, the NLP community is uniquely positioned to not only detect BPN (dis-)satisfaction from text and work out a deeper understanding of the associated communication patterns, but also to play an active role in ensuring the employed systems are BPN supportive. This is especially crucial given the impact of basic psychological need (dis-)satisfaction on a broad array of outcomes, including long-term well-being and relationship quality. In this work, we laid out how previous work in NLP has provided the foundation for the investigation of the impact of AIMC on human basic psychological needs. We then formulated ten key challenges toward BPN-aware AI-Mediated Communication. While we argue in this work for a focus on communication, the broad theoretical and empirical background provided by Self-Determination Theory allows for applications in other domains of life as well.

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