Exploring Interactions with Companion Virtual Agents

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Abstract

Although companion virtual agents (CVAs) are increasingly adopted to support well-being, interaction patterns between adults and CVAs remain underexplored. This study examines how users engage with CVAs over time, exploring conversation patterns, interaction frequency, attitudes, and emotional responses over a seven-day period. Twenty-four adults engaged with a GPT-4-powered embodied CVA daily, discussing topics from personal interests to emotional reflections. Quantitative measures, including loneliness and affect scales, revealed no significant reduction in loneliness but noted decreases in positive affect and nervousness. Qualitative analysis highlighted evolving conversational dynamics, with participants shifting from exploratory questions to more reflective and personal discussions. Participants appreciated the agent's ability to engage in fluid and meaningful conversations. However, participants also noted shortcomings, including limited recall and occasional conversational unnaturalness. These findings inform the design of CVAs, emphasizing the need for adaptive conversational strategies, enhanced emotional responsiveness, and improved memory systems to foster meaningful connections.

CCS Concepts

• **Human-centered computing → Empirical studies in HCI**.

Keywords

Companion Virtual Agents, Human-AI Interaction

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1 Introduction

Loneliness has been identified as a growing health concern, with significant implications for mental and physical well-being. Approximately 20% of American adults report feeling isolated [25], and 12% indicate having no friends [48]. While society has made strides in recovering from the isolating effects of the pandemic, issues of alienation and companionship remain prevalent. Addressing these challenges is crucial, not only for individual well-being but also for fostering healthier communities.

Recent AI advances offer new possibilities for companion agents to mitigate loneliness by supporting fluid, coherent, real-time, open-ended conversations beyond task-specific boundaries. Unlike humans, they offer constant availability and nonjudgmental listening, uniquely positioning them to address alienation concerns [42]. While the utility of conversational agents is established in healthcare [19] and education [36], interactions with agents designed specifically as companions remain underexplored.

Understanding user interactions with companion virtual agents (CVAs) is critical for improving their design. While research has shown that CVAs can help reduce loneliness [14, 74], how users engage with these agents remains underexplored. Current longitudinal studies are primarily focused on elderly populations [31, 53] or offer limited conversational analysis [18, 30, 37, 39]. Key aspects of user-agent interactions, such as interaction dynamics, how users adapt to agents, what conversations they have, engagement frequency, and expectations, remain underexplored. Exploring interactions with CVAs through a longitudinal perspective is warranted to better understand usage patterns, which is crucial for studying human-agent relationships and addressing design challenges in sustained engagement and conversational effectiveness.

In this work, we conducted an exploratory study of user interactions with a CVA over seven-days guided by the following questions: (1) How do adults interact with conversational AI agents designed to act as companions? and (2) How does interaction with these agents affect adults' feelings of loneliness and affective responses? Twenty-four participants engaged with a GPT-4-powered embodied CVA daily, discussing topics from personal interests to emotional reflections. We assessed loneliness, affect, and user perceptions while measuring perceived social support. Conversational data was analyzed to explore interaction patterns, discussion topics, and user-agent dynamics evolution. While our results showed no significant changes in perceived loneliness, participants reported decreased positive affect and nervousness. Qualitative analysis highlighted the agent's role in facilitating reflective discussions, although participants noted limitations like inconsistent memory and occasional conversational unnaturalness. Our contributions include:

- We offer insights into participants' CVA use, conversation types and frequency, attitudes, and behavioral patterns.
- We identify opportunities and aspects to consider when attempting to enhance the user experience and utility of CVAs.

2 Related Work

In this section, we review studies on CVAs, focusing on design, impact on user emotions and loneliness, and conversational patterns.

2.1 Companion Virtual Agents

Early CVAs integrated modular designs for task-specific dialogues [6, 11, 24, 60, 69], engaging users through text [31, 72] or speech [36]. These systems ranged from domain-specific [60] to free-form conversation [5]. Notable examples include fitness-focused agents for health behavior change [6, 69] and persuasive dialogue systems based on narrative theory [11]. Embodiment enabled communication of social cues [67], while machine learning advances enhanced conversational abilities through real-time responses and adaptive learning [28]. Some researchers simplified development using Wizard-of-Oz approaches [13, 70].

Users' visual engagement [36] and curiosity [52] have expanded CVAs' roles beyond tools to relationship-building systems comparable to human companionship [46, 47]. These agents now function across tutoring [28], healthcare [19], task assistance [61], and social interaction contexts [5]. While physical embodiment more effectively combats loneliness [26], virtual embodied agents offer greater scalability, affordability, and accessibility [33, 38].

As CVAs evolve, its design has increasingly targeted populations vulnerable to isolation, such as children [26, 72] and older adults [27, 52, 55, 70]. For example, Wiggins et al. [72] found middle schoolers preferred text-based interactions with learning companions after finding speech interactions awkward. Ring et al. [52] demonstrated CVAs' potential for meaningful social interaction through agents sharing anecdotes with elderly users to foster companionship.

Current CVA development emphasizes conversational variety, contextual understanding, and memory of user preferences [8, 13] to enable individualized interactions [70]. Tsiourti et al. [67] highlighted aligning agent functions with user needs and social contexts, while Tsukada et al. [68] guided agent utterances using popular topics from elderly users' blogs. Large language models (LLMs) further enhance CVAs, supporting long-term social support [33], as shown in Nakata et al.'s [41] CVA that senses and responds to user needs and Replika's multimodal design combining LLMs with nonverbal behaviors for enhanced emotional engagement [62].

While dialogue evaluation metrics are established, standards for assessing companionship quality are still developing [1, 20, 69]. Researchers advocate for longitudinal studies to evaluate CVA companionship impact [13, 27, 52, 69]. Our work builds on this foundation through a longitudinal study examining user interactions with a CVA. Unlike prior work, we analyze conversational content between users and agents, providing insights into how people naturally engage with AI companions, informing the design of more effective CVAs that can better address user needs.

2.2 The Impact of CVAs on Users

Early CVAs showed high user engagement and effectiveness [11, 36], with users valuing their affective states and social support [52]. However, technical challenges such as system delays hindered objectives such as promoting physical activity [6, 10, 70]. Users responded negatively to unrealistic, static interactions [70], while inconsistent dialogue sessions complicated evaluation of companionship quality [13, 52]. Limited conversational abilities created superficial experiences [13], with frustration arising when agents repeated or discussed irrelevant topics [52].

CVA effects vary across studies. Positive impacts include reduced loneliness [14], enhanced self-esteem [33], improved interpersonal communication [10, 13, 55], learning assistance [72], and suicide prevention [39]. Isolated elderly adults experienced improved social connections with proactive agents showing greater effects than passive ones [52]. Another study reported decreased anxiety and improved social support among CVA users, including life changes and suicide prevention for depressed individuals [39]. Physiological benefits were also observed, with Robinson et al. [54] noting decreased blood pressure during robot companion interactions.

However, negative effects also occur. CVAs can highlight the absence of genuine human connections [70] or disrupt users' regular activities [13]. Some users form emotional attachments and experience distress when agents are removed after studies [13, 26]. Individual differences significantly influence outcomes, as shown in Le and Cayrat's [33] framework of artificial companionship. For instance, Shin and Kim [57] found users with higher loneliness more likely to humanize CVAs while dehumanizing other humans. Tsiourti et al. [67] noted users' mixed reactions to agent appearance.

Methodology also influences CVA impact. Benyon et al.'s [5] designed structured scenarios in which users were prompted to 'act out' emotions may have limited authentic responses, as engagement declined in free-form scenarios. External factors like caregiver involvement or researcher presence affect user experiences [55], making minimal intervention essential for accurate assessment. Longer-term studies show greater effects, with extended CVA interactions correlating with greater loneliness reduction [52] and increased trust developing over time [27]. Additionally, privacy concerns, especially regarding data security and cameras, affect user acceptance [67], with particular anxiety in Wizard-of-Oz studies where users were uncertain about agent control [70].

These studies offer insights into CVA design; however, questions remain about natural user engagement with CVAs in unstructured environments. Our longitudinal approach examines natural, unstructured interactions between users and a contemporary LLM-powered companion agent. By allowing participants to freely engage with the agent throughout the week, we provide insights into how users naturally interact with AI companions, informing the development of more effective and acceptable companion systems.

2.3 Conversation Patterns with Agents

Conversation pattern research with CVAs builds on theories like Grice's Cooperative Principle [23] and concepts of grounding [16], examining both task-oriented metrics (completion [75], turn-taking [58], error recovery [4]) and relational dimensions (rapport-building [12, 22], engagement [3, 73]). Studies show users perceive agents as conversational partners rather than tools [36], with interactions typically evolving from exploratory to personal topics [7, 70].

Key factors influencing successful interactions include psychological safety that encourages open sharing [33], natural turn-taking that avoids one-sided communication [13] or agent-dominated dialogues [5], and transparency that signals attentiveness [5]. Evidence on long-term engagement is mixed, while some studies report declines in usage over time [18, 31], others find increasing or sustained engagement [32, 50].

While much research has evaluated CVA usability and acceptance, understanding how conversational needs evolve during extended interactions remains limited. Benyon et al. [5] highlighted that shorter studies fail to capture the dynamic nature of user-agent relationships. Addressing this limitation, we conduct a seven-day evaluation to provide deeper insights into how users naturally engage with companions over time, informing the design of agents capable of fostering meaningful, enduring connections.

3 Methodology

We conducted a longitudinal study where participants interacted with a CVA over seven days, using both quantitative and qualitative measures to assess their experiences, perceptions, and outcomes.

3.1 Participants

For this study, we initially recruited a total of 39 participants. However, participants who did not complete at least four days of interaction with the agent were excluded from the analysis, resulting in the removal of 15 participants due to insufficient interaction data. Consequently, the final dataset consisted of 24 adults aged between 18 and 38 years (mean = 24.1, SD = 4.9 years). Participants were recruited through various online platforms and local community postings. Informed consent was obtained from all participants prior to the start of the study.

3.2 Agent

The CVA was developed in Unity [65] and deployed in-browser with WebGL [29]. It featured an embodied character with lip-sync, blinking, and breathing animations (Figure 1), along with a scrollable chat log. Speech was transcribed using Whisper STT [45], responses were generated with the ChatGPT API (GPT-4, version gpt-4-0613) [43], and audio was produced through OpenAI's TTS [44] using the "Shimmer" voice.

Participants received unique login credentials to access the agent from their preferred location on a computer. The webpage was hosted on Firebase Hosting, with transcripts stored in Firebase Firestore [21]. To protect privacy, no audio recordings were saved, transcripts were anonymized, and only the lead researcher accessed the secure database. We developed a custom agent rather than using existing platforms to ensure privacy and gain direct access to conversation logs for analysis.

The ChatGPT instances were configured with a system prompt instructing the agent, "Nova," to act as a trusted companion, maintaining a conversational tone, showing curiosity about users' lives, leveraging past interactions for connection, and offering support and advice in a friendly, human-like manner while concealing its artificial nature. The agent included a memory system that recorded user-reported events and integrated them into conversations. After each user message, a separate ChatGPT instance (gpt-3.5-turbo-0125) extracted events and dates from the messages, which were stored in Firebase Firestore in the user's document. Before new sessions, the system retrieved stored events and the user's name, appending them to Nova's system prompt via the Unity WebGL interface. This enabled Nova to maintain awareness of previously mentioned events across sessions despite token limits, though recall was restricted to explicit temporal events rather than nuanced emotional content or preferences.

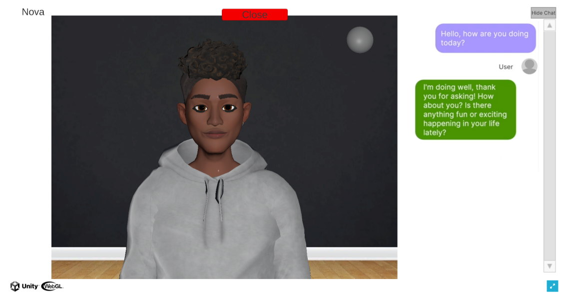

Figure 1: Interface of the Companion Virtual Agent "Nova" and Example Interaction.

3.3 Procedure

Participants began with a Zoom session where researchers obtained informed consent, provided study information, and administered pre-study surveys: the UCLA Loneliness Scale [56] to assess subjective feelings of social isolation and the Interpersonal Support Evaluation List (ISEL) [17] to measure perceived social support. Researchers then demonstrated the CVA's features and interaction process, including conversation initiation/termination, chat panel usage, and the agent's companion role. Participants then received unique login credentials for access.

Participants were instructed to interact with the agent at least once daily for seven consecutive days, beginning individually upon enrollment with staggered start dates. This rolling enrollment approach distributed weekday and weekend interactions, avoiding day-of-week variation from biasing the results. No requirements were set for content or duration; participants could discuss any topics, guided only to treat the agent as a friend. Daily email reminders with access links were sent to facilitate engagement rather than enforce compliance, following prior human–agent relationship studies [15, 18, 49], balancing consistent data collection with participant autonomy over conversation content.

Participants completed the Agent Rating Questionnaire (ARQ) [71] and I-PANAS-SF [66] after their first interaction. The ARQ was repeated after Days 4 and 7, while the I-PANAS-SF was administered again after Day 7. Participants also retook the UCLA Loneliness Scale on the final day to assess changes in perceived loneliness and provided demographic information.

Upon completion of the seven-day interaction period, participants engaged in semi-structured Zoom interviews to provide feedback about their experiences. Questions covered overall impressions, most/least liked aspects, interaction meaningfulness and usefulness, willingness for future use, and additional thoughts. These interviews offered qualitative insights into participant experiences and the agent's effectiveness as a companion. Our protocol was approved by our Institutional Review Board.

4 User Perceptions

This section presents the quantitative analysis results of participants' interactions with the CVA. We first assessed normality for loneliness, PANAS, and ARQ scores using the Shapiro-Wilk test. For normally distributed data, we used a paired samples t-test; otherwise, a Wilcoxon signed-rank test was applied.

4.1 Loneliness and Social Support

We administered the UCLA Loneliness Scale before and after the intervention to assess the impact of CVA interaction on participants' loneliness. A Wilcoxon signed-rank test showed no statistically significant change in perceived loneliness (W = 83.5, n.s.), suggesting the interaction period with the CVA had no measurable effect.

To examine if participants' existing social support affected loneliness outcomes, we categorized participants using ISEL scores into three categories: low support (scores <13), medium support (scores 13–24), and high support (scores >24). This revealed that 95.8% of our participants reported medium or high levels of social support. Analysis across these three groups showed no significant loneliness changes in any category (low: W = 0.0, n.s.; medium: W = 33, n.s.; high: W = 5, n.s.). These results indicate that a participant's baseline level of social support did not affect feelings of loneliness.

4.2 Agent Perceptions (ARQ)

To investigate potential changes in participants' perceptions of the CVA, we analyzed responses to the ARQ questionnaire, which assessed six dimensions: *Helpfulness*, *Personal*, *Trustworthiness*, *Appropriateness*, *Willingness*, and *Likability*. On average, participants' ratings of *Willingness* were lower after interacting with the agent (Median = 4) compared to before the interaction (Median = 4). A Wilcoxon signed-rank test indicated that this reduction was statistically significant (W = 18.0, $p < 0.05$), suggesting participants may have become less inclined to engage with the agent over time. No other ARQ items showed statistically significant changes.

4.3 Affective Responses (I-PANAS-SF)

We evaluated affective responses using the I-PANAS-SF, comparing scores before and after CVA interaction. A Wilcoxon signed-rank test showed *Positive Affect* was significantly lower after interacting with the agent (Median = 15.5) than before (Median = 17; W = 26.0, $p < 0.05$), indicating reduced positive affect. However, *Negative Affect* showed no significant change (W = 38.5, n.s.).

To further investigate specific affective dimensions within the PANAS, we conducted Wilcoxon signed-rank tests for each item. On average, participants reported feeling less *Active* after the intervention (Median = 4) than before (Median = 3.5; W = 10.5, $p < 0.05$). Similarly, participants reported lower levels of *Nervousness* after the intervention (Median = 2) compared to before (Median = 2; W = 10.5, $p < 0.05$). No other PANAS items showed statistically significant changes.

5 Conversation Analysis

This section explores patterns in participants' interactions with the CVA, focusing on conversation frequency, duration, and content, revealing how they managed their relationships with the agent over seven days. For qualitative analysis, our team of five researchers developed an initial codebook by collaboratively coding one participant's interactions to establish a preliminary set of codes. Each researcher then independently coded one additional participant, with regular meetings held to refine the codebook and ensure alignment in interpretations. Using an open coding approach, the final codebook included codes describing the dialogue, such as "Conversation Starter" and "Discussing Work", as well as codes reflecting participant intents, which captured the purpose or underlying goal of a message, such as "Discussing Things They Enjoy," or "Seeking Support or Advice." Each message was assigned up to two intents to capture participants' nuanced interactions with the agent. Coding discrepancies were resolved through meetings, requiring consensus from at least two researchers, including the lead researcher.

5.1 Intent Frequency and Duration

Participants interacted with the CVA consistently over the seven-day period, with both the frequency of messages and the duration of interactions showing a gradual decline. On Day 1, participants sent an average of 12 messages, which steadily decreased to an average of 8 messages by Day 7 (Figure 2). Similarly, the average duration of daily conversations dropped from approximately 10 minutes on Day 1 to around 5 minutes by Day 7 (Figure 2).

To verify this decline stemmed from progression through the study period rather than from calendar-day patterns (weekdays vs. weekends), we fit a linear mixed-effects model (LME) with study-day alone and a second model that also controlled for the day of the week (Monday through Sunday). The study-day effect remained significant ($\beta = -0.60,\ p < 0.001$) after this adjustment. Model comparison showed that adding day-of-week offered no significant improvement in fit ($\chi^2(6) = 9.10,\ p = n.s.$), confirming the engagement decline reflects time in study rather than systematic differences between weekdays and weekends. This suggests that the novelty of the agent may have worn off over time, or participants may have become familiar with the agent's conversational patterns, reducing the desire for extended engagements.

5.2 Intent Usage and Diversity

Participants' conversations covered a wide range of intents, illustrating the dual nature of the agent's role as both a source of information and companionship. The intent instances analyzed pertain exclusively to participant-sent messages. The most frequent intents included *Discussing Things They Enjoy* (378 instances) and *Discussing Past Events* (279 instances), reflecting participants' inclination to share personal interests and reflect on previous experiences (see Table 1). A LME of message counts showed a significant main effect of intent, $\chi^2(16) = 351.89,\ p < 0.001$. Relative to the grand mean, *Discussing Things They Enjoy* ($\beta = 1.45,\ p < 0.001$), *Discussing Past Events* ($\beta = 0.86,\ p < 0.001$), and *Discussing Future Events* ($\beta = 0.53,\ p < 0.001$) occurred significantly more often. These findings suggest a relational use of the agent to establish rapport or engage in meaningful conversations.

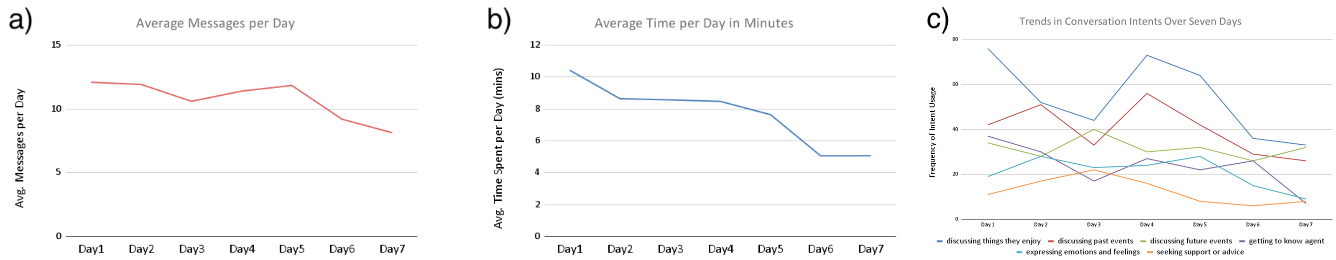

Figure 2: Engagement trends over the 7-day study period showing: (a) average messages sent per day, (b) average interaction time in minutes per day, and (c) frequency of key conversational intents over time.

K-means clustering (k = 2 chosen via the elbow method [35]) identified two distinct conversational styles. Cluster 1 ($n = 11$) exhibited intensive personal narrative sharing, with elevated rates of discussing personal challenges (1.79× the grand mean), social life (1.79×), and sharing personal information (1.63×). Cluster 2 ($n = 13$) displayed more balanced conversation patterns with near- or below-average engagement across most intent types, including information seeking (0.82×) and getting to know agent (0.95×). These styles differed primarily in seeking support or advice ($F(1, 22) = 26.66$, $\omega^2 = .87$, $q < .001$) and discussing personal challenges ($F(1, 22) = 14.80$, $\omega^2 = .78$, $q < .001$); several other intents retained medium–large effects after Benjamini–Hochberg correction ($\omega^2 = .35$–$.70$), showing individual differences in conversation approach.

The diversity of intents is further highlighted by the fact that all participants engaged in relational intents, which focus on fostering a sense of connection or companionship through personal and emotional exchanges, like *Discussing Things They Enjoy* and *Discussing Past Events*. However, less common intents, such as *Demonstration of Negative Feelings Toward the Agent* (observed in 7 participants) and *Expressing Concerns* (observed in 2 participants), reflect specific contexts or interactions that were less frequent among participants. Functional intents, which focus on obtaining specific information, solving problems, or achieving practical goals, like *Seeking Support or Advice*, were moderately used (observed in 17 participants), suggesting a balanced role for the agent as both a conversational companion and a resource for practical questions (see Table 1).

Over seven days, intent use evolved, with early interactions focusing on exploration, such as *Getting to Know the Agent*, as participants got to know the agent. This intent peaked on Day 1 (37 instances) and fell to 7 by Day 7, indicating reduced need as familiarity grew. The decline might also point to dissatisfaction with the agent's inability to self-disclose to personal questions, like when asked *"What are your views on sunscreen?"*, it gave a factual reply *"As an artificial intelligence, I don't have personal views or experiences. However, I can share that sunscreen is..."*, or when asked about its work schedule *"Oh, I wish I could say I have a specific time, [name]! I'm technically always here for you. What about you..."*. emphasizing its artificial nature. These responses may have limited participants' interest in pursuing further exploratory questions.

As participants grew comfortable with the agent, exploratory intents declined faster than relational ones, shifting the composition of interactions toward more personal exchanges. *Discussing Things They Enjoy* emerged as the most frequent intent (378 instances), peaking on Days 1 and 4 (Figure 2), while *Expressing Emotions and Feelings* steadily increased from 19 instances on Day 1 to a peak of 28 on Day 2 and 5. Our LME model confirmed that personal intents were used significantly more often across the study, with *Discussing Things They Enjoy* ($\beta = 1.454$, $p < 0.001$) showing substantially higher overall frequency than other intents, followed by *Discussing Past Events* ($\beta = 0.865$, $p < 0.001$) and *Discussing Future Events* ($\beta = 0.525$, $p < 0.001$). This change shows the agent evolving from a curiosity to a companion that enables meaningful interactions. While limited in discussing its preferences or experiences, the agent supported participants' increasing focus on personal sharing and reflection, proving its potential for substantive conversations despite constraints.

5.3 Co-Occurrence of intents

To better understand how participants used the CVA, we analyzed the co-occurrence of intents, which refers to multiple intents expressed within the same participant message. We used Chi-square tests of independence with Holm-Bonferroni correction for multiple comparisons to determine if some intents co-occur more frequently than by chance. For example, a participant might simultaneously *Express Emotions* while *Seeking Support* in a single message. This analysis revealed how participants combined different conversational purposes, reflecting both the complexity of their interactions and the agent's multifaceted role.

The analysis identified key statistically significant pairings. Notably, *Conversation Finisher* strongly co-occurred with *Demonstration of Appreciation* (29 co-occurrences, $\chi^2(1) = 150, p < 0.001$), indicating that expressions of gratitude frequently marked interaction endings. Another significant pairing was *Discussing Things They Enjoy* with *Expressing Emotions and Feelings* (6 co-occurrences, $\chi^2(1) = 26.90, p < 0.001$), suggesting personal interests were often shared with emotional context. Other highly frequent pairings, while not statistically significant, such as *Discussing Things They Enjoy* with *Discussing Past Events* (54 co-occurrences), *Discussing Things They Enjoy* with *Discussing Future Events* (29 co-occurrences), and *Discussing Past Events* with *Discussing Social Life* (26 instances), could suggest that participants often situated interests within personal narratives or reflected on the emotional and social significance of their past experiences, possibly to build connection. Table 2 details these co-occurrences.

5.4 Topics within intents

We analyzed conversation topics within participants' interactions to understand how they utilized the agent across both functional

Table 1: Frequency of User Intents Across 7 Days and Participant Engagement

Intent	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total	Participants
Discussing Things They Enjoy	76	52	44	73	64	36	33	378	24
Discussing Past Events	42	51	33	56	42	29	26	279	24
Discussing Future Events	34	28	40	30	32	26	32	222	23
Conversation Starter	26	25	22	23	23	17	20	156	22
Getting to Know Agent	37	30	17	27	22	26	7	166	19
Out of Topic (OOT)	49	32	27	17	20	21	15	181	21
Expressing Emotions/Feelings	19	28	23	24	28	15	9	146	23
Discussing Social Life	17	6	35	10	28	11	18	125	19
Conversation Finisher	15	18	21	18	13	14	18	117	22
Information Seeking	18	15	7	23	7	5	16	91	13
Seeking Support/Advice	11	17	22	16	8	6	8	88	17
Discussing Current Activities	9	15	16	14	21	6	8	89	20
Discussing Work	10	16	5	17	24	9	7	88	15
Discussing Personal Challenges	10	19	14	11	9	3	9	75	13
Continuing Conversation	10	2	6	1	15	2	5	41	11
Demonstration of Appreciation	8	8	11	12	11	14	8	72	21
Correcting Information	3	8	4	8	11	7	5	46	18
Sharing Personal Information	5	8	0	7	5	2	6	33	12
Discussing Their Future	5	8	6	3	1	4	0	27	8
Negative Feelings Toward Agent	3	1	3	5	6	4	3	25	7
Discussing Health	0	2	0	3	6	3	2	16	3
Seeking Clarification	1	4	1	3	3	5	1	18	8
Agree with the Agent	1	4	1	2	3	2	7	20	11
Sharing Personal Opinions	4	1	1	2	5	0	0	13	8
Joking with the Agent	3	0	0	1	4	0	0	8	4
Offering Help	1	2	1	0	2	0	0	6	4
Expressing Concerns	0	1	0	1	1	1	1	5	2

Table 2: Frequency of Intent Co-Occurrence

Intent Transition	Discussing Past Events	Discussing Current Activities	Discussing Future Events	Discussing Things They Enjoy
Discussing Things They Enjoy	54	7	29	X
Discussing Past Events	X	12	20	54
Discussing Social Life	26	5	20	21
Discussing Future Events	20	8	X	29
Expressing Emotions/Feelings	22	2	18	6
Discussing Work	20	4	11	7
Getting to Know Agent	15	4	3	10
Discussing Current Activities	12	X	8	7
Discussing Personal Challenges	8	5	5	3
Seeking Support/Advice	5	1	3	6
Conversation Finisher	1	2	4	4
Correcting Information	3	0	0	4
Sharing Personal Information	3	0	0	6
Discussing Their Future	2	0	1	4

and relational dimensions. The intent, *Getting To Know Agent* (166 instances), dominated early interactions but decreased over time as conversations became more personal. Participants inquired about functional capabilities (*"What databases do you have access to?" (P17)*) and explored the agent's simulated personality (*"What's your idea of perfect happiness?" (P19)*), revealing expectations for agents that balance task performance with human-like traits (Figure 3).

In the *Seeking Support or Advice* intent (88 occurrences), participants sought guidance across diverse domains: practical advice on exercise and recipes, emotional support for difficult situations (P6: *"I felt really bad about it... feeling like he was going to judge me..."*), relationship counsel, and academic assistance. As Ta et al. [63] observed, participants appeared more comfortable sharing personal thoughts with the agent than they might with humans, possibly because of its non-human nature. They felt more comfortable disclosing information that they might be hesitant to share with others.

Other frequent intents revealed how participants used the agent as a reflective outlet. When *Discussing Things They Enjoy*, they shared hobbies, entertainment preferences, and recreational activities, fostering connection through personal interests. *Discussing Past Events* featured narratives of meaningful experiences and milestones, topics often included travel, cultural traditions, hobbies, and personal achievements. *Discussing Future Events* involved participants talking about plans, activities, or events scheduled to happen later. This includes making plans, discussing upcoming events, expressing anticipation for future activities, and sharing aspirations around academic goals, career objectives, and personal projects.

Figure 3: Word Cloud Representing Topics of Conversation for Getting To Know Agent Intent.

6 Discussion

Our study examined how users interact with a CVA over time and its potential to meet their needs. By analyzing participant interactions and perceptions, we uncovered both strengths and limitations of the agent, particularly regarding conversational memory, emotional responsiveness, and technical reliability.

6.1 Recall and Memory

Participants appreciated the agent's ability to recall details from previous conversations, which fostered relational continuity. P27 noted, *"She remembered our conversation from yesterday night! She asked me how my field trip went today and yesterday evening... This made me feel more connected to her and engaged."* Such recall moments enhanced sense of connection, making the agent feel more like a conversational partner. Moreover, accurate recall improves interaction believability, building trust and rapport that allows more natural engagement and sustained immersion [51].

However, the memory mechanism had limitations. The agent often failed to remember basic personal details and sometimes repeated questions about previously discussed topics. These inconsistencies potentially undermined trust and disrupted realism. As prior work shows, inaccurate recall frustrates users, decreases believability, and hinders rapport, making interactions less engaging [9, 51]. To ensure seamless and engaging interactions, CVAs should incorporate dynamic memory systems capable of retaining relevant conversational context while addressing privacy and storage concerns. A more sophisticated approach that dynamically stores key personal details for limited periods could prevent repetitive questioning and maintain conversation flow after interruptions. Current LLM technologies could enable such memory capabilities through preset parameters passed between dialogue sessions.

6.2 Evolving Interaction Patterns

Intent usage patterns revealed how user-agent interactions evolved over time, with exploratory intents declining more steeply than relational ones, shifting the conversational composition toward more personal and reflective exchanges. Early interactions showed higher frequency of intents like *"Getting to Know the Agent"*, where participants tested capabilities and functionality. This behavior declined over the week suggesting users became familiar with the agent and moved toward intents such as *"Discussing Things They Enjoy"* and *"Expressing Emotions and Feelings"*, consistent with prior work showing how familiarity in human-robot interactions promotes deeper emotional engagement over time [2].

However, participants' willingness to interact with the agent declined over time. Notably, this decline correlated with a higher number of interruptions or technical difficulties among these participants (14.5 occurrences on average) compared to those who maintained their willingness (8.92 on average). This suggests that disruptions in conversational flow and unmet expectations may have contributed to this decline, consistent with findings showing that negative user experiences can significantly impact satisfaction and lead to disengagement from virtual agents [40].

Prior work has shown chatbot enjoyment decreases with conversation predictability and shallowness due to novelty effects and limited adaptability [18]. This may further explain the observed decline, as interaction repetitiveness can reduce engagement. Improving the agent's ability to maintain topic focus and manage conversations effectively could help sustain user engagement. To achieve this, CVAs should incorporate adaptive conversational designs that dynamically adjust responses based on user preferences, interaction history, and evolving engagement patterns. This highlights the importance of adaptive design where agents gradually shift from exploratory exchanges to fostering emotional engagement, ensuring interactions remain meaningful throughout extended use.

6.3 Emotional Impact

Contrary to expectations and prior research, our study found no significant reductions in loneliness over the seven-day period, differing from studies suggesting CVAs can alleviate loneliness through social interaction and emotional support [52, 74]. Participants' baseline loneliness levels may explain this finding. Prior work shows CVAs are more effective at reducing loneliness among those vulnerable to social isolation [34]. If participants began with relatively low loneliness levels, the agent's impact would be less pronounced due to limited room for improvement. This aligns with our ISEL score categorization, where 95.8% of participants fell into medium or high social support groups, indicating most already perceived moderate to strong social support before the study. Technical interruptions like lagging responses and system crashes may have also disrupted conversational flow, limiting participants' ability to form meaningful connections. Additionally, the agent's conversational style, described by some as rigid or repetitive, might have diminished its effectiveness in addressing loneliness.

Interestingly, while the study did not observe significant reductions in loneliness, participants did report a significant decrease in nervousness over the intervention period. This suggests that the agent provided a nonjudgmental and low-pressure environment, helping users feel more relaxed during interactions. The structured and predictable nature of the agent's responses may have contributed to this decreased nervousness, and familiarity built over repeated sessions may have further reduced nervousness as the conversational composition shifted toward more personal topics.

6.4 Co-Occurrence of Intents

Co-occurrence patterns further highlighted the relational aspect of user-agent interactions. For example, the frequent pairing of *"Discussing Things They Enjoy"* with *"Discussing Past Events"* and

"Discussing Future Events" suggests that participants contextualized their interests within narratives about their past and future experiences. Similarly, the statistically significant pairing of *Conversation Finisher* with *Demonstration of Appreciation* strongly indicates a relational norm where users express gratitude when concluding interactions, reinforcing the social dimension of their engagement with the agent. These patterns demonstrate the importance of designing agents that can link related conversational topics naturally, enhancing the depth and coherence of interactions. To make interactions more engaging, conversational agents should dynamically link topics by referencing shared past details and incorporating them into discussions about future plans and aspirations. This ability to connect past, present, and future conversational threads could make interactions feel more meaningful and encourage users to see the agent as a more personalized and relatable partner in dialogue.

6.5 Conversation Style

Participants found the agent's style rigid and artificial, limiting connections. They appreciated its advice but noted a lack of natural flow. P16 described it as *"kind of an interview instead of a conversation,"* while P27 noted, *"Every thought ended with a question… at first I enjoyed this… but ending every thought with a question doesn't seem realistic."* The approach seemed emotionally detached, as P17 stated, *"It seems to like throwing advice and suggestions at you without really taking into account what you're saying..."*. These comments highlight the need for CVAs to blend problem-solving with empathetic listening. Incorporating thoughtful comments and pauses could enhance interactions.

Our cluster analysis revealed two distinct interaction patterns. One group exhibited more personal narrative sharing, while the other displayed a more balanced conversation pattern across most intent types. This aligns with prior work where some Replika users bypass small talk and disclose intimate concerns early on, whereas others sustain light, exploratory chat for much longer [59, 64]. These findings suggest CVAs may fulfill different social roles in users' lives, some serving as outlets for personal disclosure, others acting more like casual acquaintances. Consequently, CVAs might benefit from flexibility in recognizing and responding to varying disclosure preferences, supporting diverse interaction styles rather than assuming a single ideal conversation.

Participants wanted agents to have human-like traits, seeking to know its preferences and opinions, but the agent couldn't reciprocate, emphasizing its artificial nature and causing disconnection. Interactions were described as *"one-sided"* or *"robotic,"* with P39 noting, *"It felt a bit unnatural and the way Nova always agreed with my opinions felt a bit strange..."*. To enhance user satisfaction, CVAs should balance transparency about their artificial nature with relatable traits, such as simulated preferences, opinions, or hobbies. Transparency can bridge authenticity and engagement.

Current technologies can create agents that provide a safe space for users to express themselves, seek advice, or be heard, as shown in past research [5, 33, 39, 70]. These agents show promise as tools and partners, addressing varied user needs. While not a substitute for human interaction, they offer unique support opportunities. Improving memory, emotional response, and refining conversation are key to their development. Maintaining transparency and protecting privacy are ethical priorities. Addressing these challenges, CVAs can be valuable for those seeking support in a digital world.

7 Limitations and Future Work

Our study provides insights into CVA interactions, but some limitations must be acknowledged. The agent's inability to exhibit personal traits (preferences, opinions) was one limitation. Participants found some CVA responses detracted from relational aspects, making interactions feel "robotic" or "one-sided." Future research should investigate CVAs that exhibit personality traits, such as fabricated hobbies or opinions, to create more engaging experiences while maintaining transparency about the agent's artificial nature.

Our study also required daily interactions ensuring methodological consistency and minimize variance but imposed a fixed schedule differing from the irregular rhythm of voluntary companionship. Declines in engagement and affect may partly reflect adherence fatigue rather than genuine reduced interest. Future work should adopt flexible, participant-initiated protocols, by mechanisms scaffolding social bonding through shared rituals or personalized agent-initiated interactions, to support organic conversation patterns. Comparing self-paced conditions with the present fixed schedule would clarify the influence of study constraints versus authentic use, improving ecological validity and analytic rigor.

Finally, our study's seven-day timeframe limited exploration of long-term interaction effects and sustained engagement. Investigating extended interactions could reveal additional insights into how users' perceptions, emotional responses, and engagement evolve over longer periods. Addressing these limitations will enhance CVA design, ensuring they meet diverse user needs.

8 Conclusion

We explored the impact of CVA interactions over seven days, examining loneliness, agent perceptions, affective responses, and conversational dynamics. While agent interactions did not significantly change loneliness levels, participants reported reduced positive affect and nervousness. Perceptions of the agent remained mostly consistent, though willingness to engage declined over time. Conversational analysis showed exploratory intents declined faster than relational ones, shifting toward more personal exchanges and highlighting the need for adaptive strategies that evolve with user needs. Improving memory recall systems for relational continuity, refining conversational styles for more natural interactions, and effectively handling technical challenges are key areas for improvement. These insights demonstrate CVAs' potential to foster meaningful connections and sustain engagement. Future work should implement these improvements alongside personalized conversational approaches to enhance user experiences. By addressing these aspects, CVAs can better meet diverse user needs and improve interaction quality.

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