Conversational Agents to Support Couple Therapy

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There is a growing rate of marriages and relationship dissolution as couples surrender efforts to reconcile. Couple therapy provides psychotherapeutic solutions for this problem. However, it is not easily accessible due to scheduling difficulties or cost. Conversational agents (CAs) could provide more scalable access to couple therapy. This study investigates the suitability of conversational agents for individual therapy for couple problems. Couple Therapy Chatbot is a Wizard-of-Oz intervention using cognitive-behavioural couple therapy (CBCT) with individuals via an instant messaging platform. 12 participants trialled Couple Therapy Chatbot via single-session therapy. A qualitative self-reported questionnaire provided suitability insights. Thematic analysis revealed that while some participants appreciate deep and constructive responses and human-like empathy, others dislike generic and impersonal responses. Using CAs for couple problems appears to be a suitable application and may assist in mitigating relationship dissolution. Future work can assess efficacy using automated CA solutions against larger and more selective samples.

CCS CONCEPTS • **Human-centered computing • Empirical studies in HCI**

Additional Keywords and Phrases: Conversational agents, chatbots, cognitive-behavioural therapy, couple therapy, Wizard-of-Oz

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1 INTRODUCTION

In 2019, there were 49116 divorces granted in Australia alone, equating to 1.9 divorces per 1000 estimated resident population [1]. Marriages and relationships continue to dissolve as more distressed couples surrender their efforts to reconcile. Dugal et al. emphasised that mental disorders have a bi-directional impact on relationship health. They mention that performing individual therapy in a couple's context can benefit relationship quality [2]. Investigating this relationship between individuals and relationship health further may mitigate relationship dissolution.

Several studies have used psychotherapeutic CAs based on cognitive-behavioural therapy (CBT) methods. Most studies have focused on significant changes in depression and anxiety levels [4, 5, 10, 11, 12]. Some papers tested for general

psychological well-being [3, 7, 9]. A couple of studies measured the impact of CAs on other mental ailments, such as attention deficit hyperactivity disorder (ADHD) and panic disorder [6, 8].

This pilot study intends to determine the suitability of conversational agents for couple therapy using an appropriate psychotherapeutic protocol. Ultimately, the study will provide preliminary findings to automate couple therapy using current technology. To this end, a pilot study using the Wizard-of-Oz framework implementing CBCT was performed. It used a particular type of couple therapy involving individual treatment. The proceeding subsections will provide context for the approach rationale and relate them to the efforts of relevant prior studies.

1.1 Cognitive-behavioural Therapy

Cognitive-behavioural therapy (CBT) is a problem-focused psychotherapy method used widely by clinical psychologists. Albert Ellis pioneered this method, revolutionising the objective and solution-oriented psychotherapy paradigm [13]. According to CBT, thoughts and core-beliefs influence behaviours and actions [14]. Ellis' ABC Model of CBT was a significant contribution. This model provides therapists with a practical, step-by-step protocol for treating patients using CBT principles.

Ellis' ABC model is a three-phase framing of a CBT patient's problem. Core beliefs about an individual's self-worth influence everyday behaviours and interactions with the external world. Beck supports this by illustrating a self-destructive cycle of how negative views about the self lead to negative views about the world, developing a negative view of the future. The ABC model maps a patient's core beliefs into three distinct phases: A) An activating event, B) behavioural response, and C) the consequence of the behaviour.

An activating event is a trigger, a specific thing that happens to a patient that causes grief or suffering. The behavioural response is the emotion they feel from the event and their action afterwards. The consequence is the impact that the behaviour has on their relationships and other aspects of everyday life. Ellis weaves a technique called "disputing" during the phases to challenge the patient's core belief. Disputing takes the form of probing questions. For instance, if a patient believes their partner is cheating on them, a therapist may ask: "What would it mean about you if your partner cheated?". These probes challenge the reality of their core beliefs and assist in concretely identifying them.

Some recent studies in HCI have implemented the ABC model in their CA interventions. A study by Denecke et al. implemented Ellis' ABC model into their CA "SERMO" as part of their CBT treatment investigation [15]. The dialogue of the CA flowed through a process of A) identifying an activating event, B) asking for thoughts and emotions about the event, and C) presenting information about their specific emotion and therapeutic activities. The study participants scored high on a User Experience Questionnaire (UEQ) for perspicuity, attractiveness, and efficiency. The authors used an emotion recognition approach, as opposed to problem resolution.

1.2 Cognitive-behavioural Couple Therapy

Cognitive-behavioural couple therapy (CBCT) applies CBT principles, including Ellis' ABC Model, to assist couples experiencing relationship distress. Dugal et al. have detailed the responsibilities of CBCT therapists through a literature review: 1) Allow fair amounts of time for each partner, 2) provide empathy and 3) always maintain neutrality [2]. They have provided an example of dialogue between a CBCT therapist and one partner, as seen in Figure 1.

The dialogue applies all three CBCT therapist responsibilities. Elements of Ellis's ABC model are also present. There is an identifiable flow of conversation in this dialogue which justifies an attempt to recreate it as a CA.

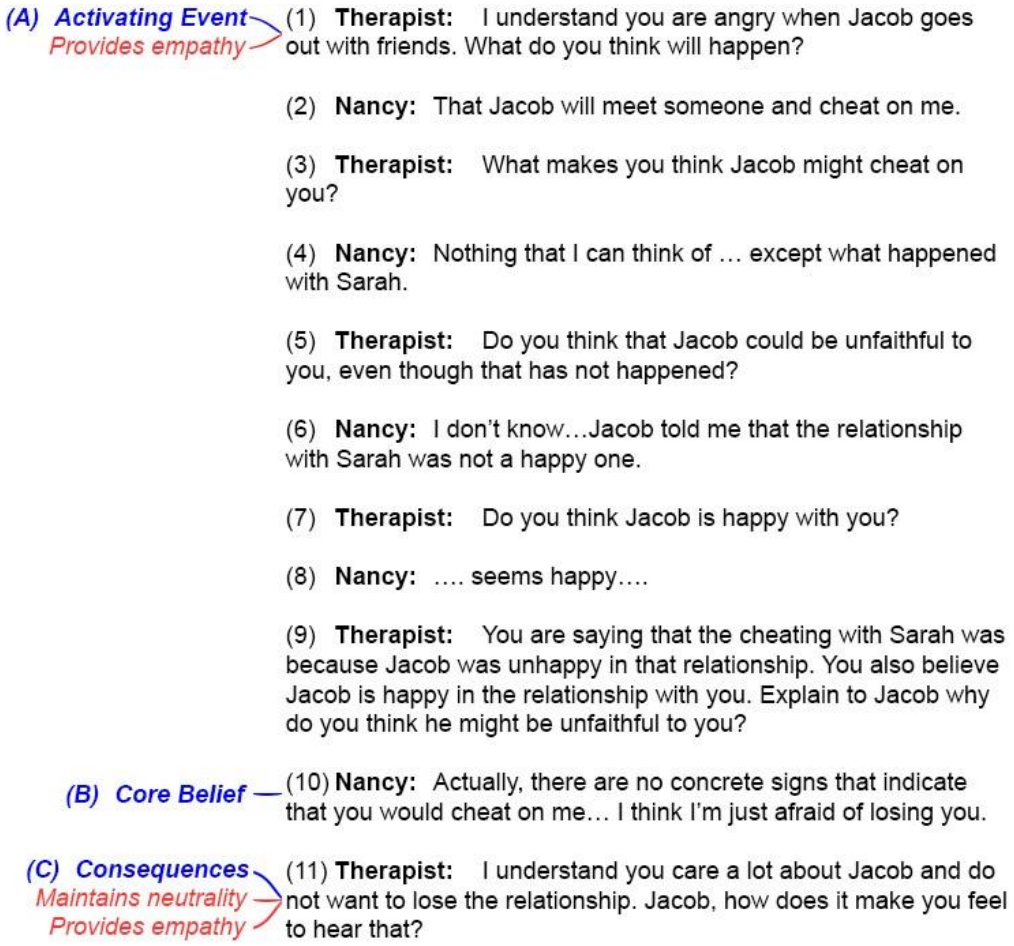

Figure 1: An example dialogue between a CBCT therapist and one partner [2].

Utami and Bickmore have explored a similar implementation of behavioural-couple therapy (BCT) for their couple therapy robot as part of their continuous efforts to develop an entirely automated couple therapist. Their study approached a methodical collection of data, training model design, treatment validation and evaluation. It demonstrated overall user satisfaction, with a mean score of 5.9 (SD = 1.29) in a questionnaire where 1 was least satisfied, and 7 was very much satisfied [16]. Further, Motalebi & Abdullah explored the development of a framework for applying CBCT using CAs. They have suggested a turn-taking interaction model driven by the user's choice of intent [17].

Utami and Bickmore's future objectives include supporting more couple counselling techniques, while Motalebi & Abdullah will seek to understand more about the acceptability and usability of their design. This current study can provide evidence to support both prior works by applying individual therapy for couple problems and assessing its suitability.

1.3 Duration of Therapy

The length of and the number of sessions in psychotherapy treatments is a factor that requires consideration. CBT is a relatively brief treatment method, typically concluding after 10-20 sessions. Hazlett-Stevens & Craske acknowledged that

CBT methods are evolving to become more efficient and cost-effective; they have also acknowledged the emergence of novel computer-assisted therapy methods [18].

The usability of CAs is affected by how conveniently users can access them. CAs used in previous studies have possessed single "drop-in" or "walk-in" style qualities, where users could speak to them whenever they required treatment. Zheng et al. explored a "knock-on-the-door" strategy for their CA, PocketBot, where users could at any time inform the chatbot that a conflict has occurred with their partner. PocketBot would then contact the other partner and inquire if they would like to initiate a session. The authors suggested that this strategy successfully mediates emotionally distressed couples [19].

The efficacy of "walk-in" single-session therapy (SST) is a debated method that requires further investigation and empirical evidence. Hymmen et al.'s review revealed that most patients found SST sufficient and helpful [20]. The literature implied that the SST method delivers a perceived improvement in depression, anxiety and other mental health ailments. Hymmen et al. highlighted, however, that the studies were methodologically limited. They suggested further research with standardised measures and randomised-controlled trials with larger sample sizes.

1.4 Individual Therapy for Couple Problems

Several studies have applied psychotherapy techniques to individual participants using CAs and have demonstrated significant positive improvements in mental health. Ly et al. concluded that participants had better psychological well-being and less perceived stress after treatment with a CBT mobile-app chatbot [7]. Suganuma et al.'s participants reported improved well-being and decreased negativity after a 4-week randomised controlled trial with a CBT CA [9]. As previously mentioned, relationship satisfaction and individual mental health have a bi-directional relationship [2]. These studies' significant improvements in individual health suggest that individual therapy for couple problems can be a promising area for CAs research.

It can be challenging to organise traditional group therapy where both parties are present simultaneously [21]. This issue is critical to consider as requiring synchronous engagement may diminish the user experiences of CAs [7]. Providing individual therapy for couple problems is an evidence-based method to address this issue. The method entails individuals in a relationship receiving therapy separately rather than alongside their partner. Zilbergeld states that the method is beneficial for couples with unstable partners with only one person willing to commit to therapy, not committed or already undergoing personal therapy. They stress that therapists must consider common pitfalls of individual therapy for couples, such as limitations with changing couple dynamics, unconsciously taking sides, providing inaccurate advice based on the distorted recollections of individuals, and lacking clear and consistent objectives or ethical consideration.

2 METHODS

2.1 Intervention

Couple Therapy Chatbot (CTC) is a CA, built by the authors on the Facebook Messenger instant messaging platform. The decision to host it on another popular application takes inspiration from Motalebi & Abdullah's turn-based CBCT adaptation for Amazon Alexa [17] and Zheng et al.'s PocketBot, built upon the Telegram instant messaging platform [19]. The aim was to pilot-test the potential role of CAs in efficiently supporting CBT-based individual couple therapy without technical complexities. The authors employed a Wizard-of-Oz experiment to simulate the CTC as a fully functional CA. A Wizard-of-Oz experiment informs participants that they are interacting with a computer system using natural-language processing, though realistically, the interaction is controlled by a human known by convention as the "wizard" [22].

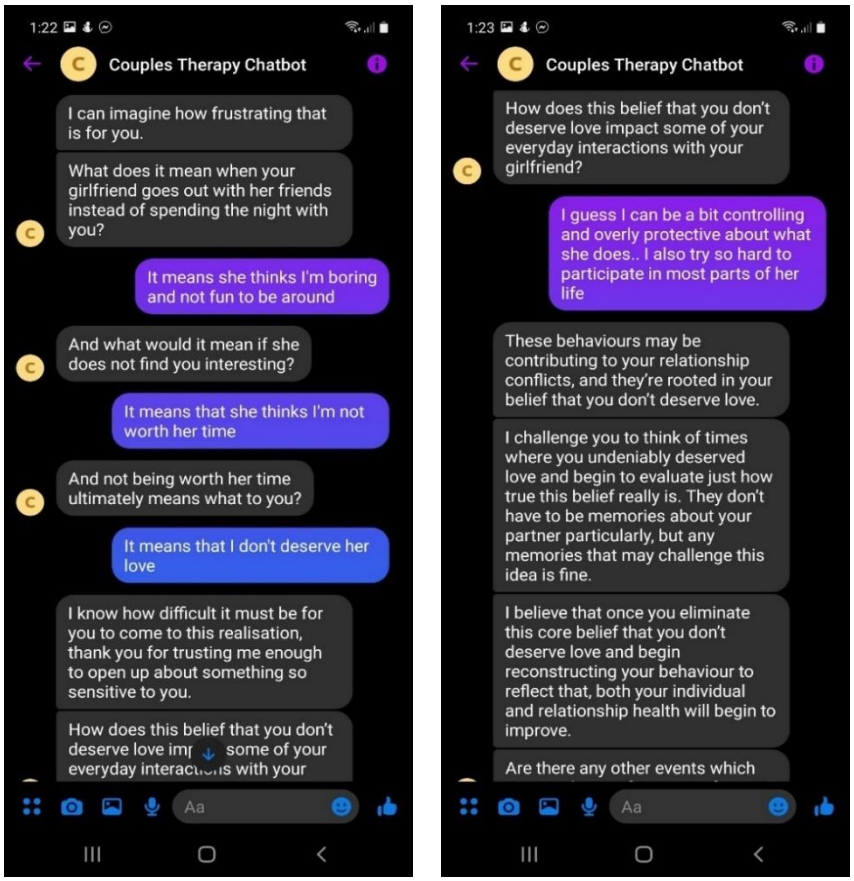

Figure 2: Sample conversation with Couple Therapy Chatbot.

Although the Wizard of Oz method has been used by many CA research studies in the past, there are challenges that risk diminishing validity if not adequately considered. Confirmation bias is a risk for Wizard-of-Oz experiments, primarily when researchers perform as wizards themselves [23]. The desire to satisfy an alternative hypothesis may interfere with the autonomy of the CA. This interference spawns inconsistency across participants and will potentially generate biased results. Eight types of text prompts and responses with one to four variations were prepared before treatment to mitigate this risk. The text contained blank spaces, which the wizard appropriately populated based on participant input. This strategy maintained a consistent conversational flow across all participants and kept conversations grounded in Ellis' ABC model. This model guided the CBT treatment of CTC.

CTC is a user-initiated system. Once a participant messages the CTC, it responds with a greeting, and the ABC model starts with Step A.

Step A. The CTC asks for an activating event to begin: "Please tell me, what is something that has happened recently between you and your partner that has caused you some frustration?". Once the participant provides an activating event, the CTC responds empathically to provide emotional validation: "I can imagine how frustrating that is for you".

Step B. The CTC continues with Step B by asking some follow-up questions: "What does it mean when…?", "And what would it mean if…?". The CA repeats this step until it identifies a core belief and explores related behaviours. Before

Step C, the CTC sends another empathetic response to acknowledge the significance of the core belief's discovery: "I can imagine how difficult it was to express this about yourself. Let us try to unpack it and deal with it together".

Step C. The last step of the conversation attempts to link the core belief to interactions that risk relationship dissolution: "How does this belief that you … impact some of your everyday interactions with your partner?", "These behaviours may be contributing to your relationship conflicts, and they are rooted in your belief that you …". Finally, the CTC asserts that by identifying and reducing the interactions driven by limiting core beliefs, mental and relationship health may improve. It suggests that the participant could achieve this by challenging the reality of their beliefs by applying them to scenarios that demonstrate their falsehood: "I challenge you to think of times where you undeniably … and begin to evaluate just how true this belief is. They do not have to be memories about your partner particularly. However, any memories that may challenge this idea are great". The session concludes with a prompt that asks if the participant would like to continue with another activating event. If the participant replies, "yes", the conversation cycles back to Step A. If the participant replies "no", the CTC concludes the conversation empathically: "You've done so well. I hope you enjoyed our session, and I wish you and your partner the best."

The CTC uses a fall-back response when an unexpected prompt is received: "Sorry, I did not get that. I am still learning how to understand you.". It then repeats the most recent prompt back to the participant. This error response is used by the wizard consistently. It requires intuiting whether 1) a real autonomous computer would understand the text through natural-language processing and 2) if the conversation is at risk of diverging from the treatment.

2.2 Study Design and Participants

This study was planned as a pilot study. The CTC delivered treatment immediately after recruiting the participants. Then, qualitative feedback was collected post-treatment. The study was completed within ten minutes in a single session, with most participants committing to one turn through the CTC conversational cycle.

There were 12 participants recruited for this study. Of the sample, 10 participants were couples. The remaining 2 were individuals whose partners did not participate. There were 5 females and 7 males, all under 30 years of age. The authors recruited participants through personal and professional networks and contacted them online through instant messaging. Convenience sampling was used as part of this pilot study. This decision meant participants were not screened for existing relationship problems. Any persons in a relationship at the time were eligible to participate. The participants' partners were also invited to participate in the study. The University of Technology Sydney approved this study for ethics and safety compliance.

2.3 Qualitative Analysis

The authors asked three open-ended questions to the participants at the end of the session: 1) "What was the best part about your experience with this chatbot?", 2) "What needs to be improved about the experience?" and 3) "How do you think this chatbot might compare to traditional treatment?". Inductive thematic analysis was applied to analyse the participants' responses [24].

3 FINDINGS

Thematic analysis revealed five unique themes based on post-treatment responses, with sub-themes detailing both favoured and unfavoured aspects of the CTC experience. The themes touch on the key experiences explored by the participants during the study.

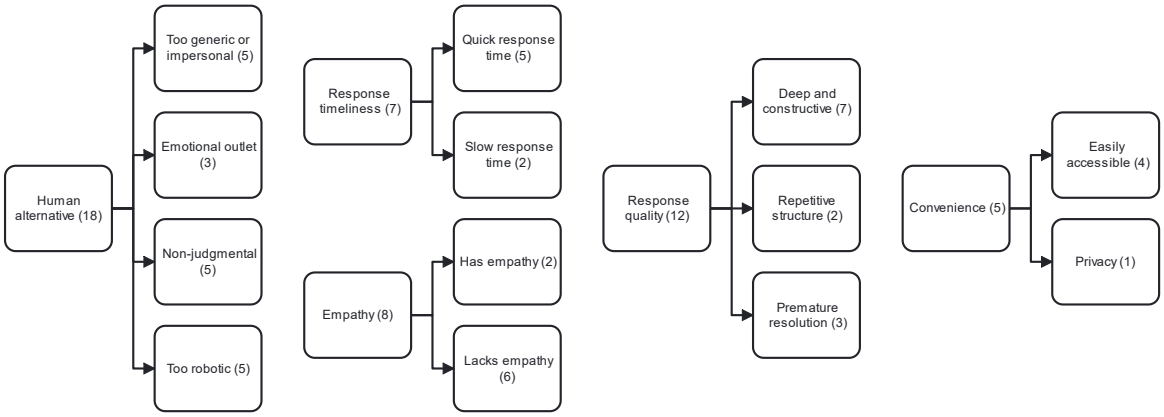

Figure 3: A thematic analysis of participant responses to key experiences

The most popular theme was CTC as an alternative to a human couple therapist (n = 18). Some participants found the CTC's conversation too generic or impersonal to replace a human (n = 5). They felt that the CTC did not tailor its responses to their specific situation. P9: "Prompts were generic, the chatbot does not understand many of the responses, gave me the feeling that I was talking to a robot who cannot empathise with my situation". Some participants enjoyed this alternative because it provided an emotional outlet they could not find in their human interactions (n = 3). P1: "It was good because it created a space where I could dump information and get out all the mental chatter so that I would not overthink or repeat thoughts in my head repeatedly". P11: "Sometimes just need someone (or something) to listen and allow them to vent issues and frustrations". Other participants enjoyed the alternative as they appreciated the absence of negative judgement (n = 5). P6: "The chatbot might make it easier for people to open up and communicate how they feel without being judged". Some participants thought the responses were too robotic (n = 5). Too robotic meant that the CTC's conversation was noticeably artificial, disillusioning the participants, as they expected a more human-like experience. P8: "To make the bot sound less robotic? I do not know, I felt uncomfortable talking to it, and it was messaging me just for its sake".

Most participants valued response quality (n = 12). CTC provided deep and constructive insights (n = 7). P12: "…I understand that the chatbot is not overly complex in its analysis. However, it was surprising how constructive and helpful the advice given by the chatbot was". For a couple, the conversation's structure and flow seemed too repetitive (n = 2). The repetitive structure revealed the underpinning protocol of the CTC, diminishing the participants' sense of immersion and the authenticity of their responses. P7: "Probably the structure of the answers was the same.". P6: "…My girlfriend and I received different responses but of the same structure, which made it a bit less immersive". A few participants thought CTC resolved their problem prematurely (n = 3). They felt the CTC resolved their conversation before sufficiently exploring their problem. P10: "While the questions do ask to go deeper, it seems like they are too generic and end before a resolution is agreed upon"; "I think traditional treatment would attempt to work through the issues in a bit more detail. To improve the bot, maybe implement a threshold where it has enough data/keywords before it makes a decision".

Empathy was an essential theme among participants (n = 8). A couple appreciated the empathy present within the responses (n = 2). P4: "It empathised with what I was saying. It did not feel robotic in a way where it just wanted to diagnose the issue". Contrary to this, most participants agreed that the responses lacked emotion and a vital sense of empathy (n = 6). P5: "The responses do not seem genuine like when talking to another human being. It is harder to create a deeper, meaningful and emotional connection with the chatbot. There needs to be some empathy".

Participants expressed their appreciation for response timeliness (n = 7). Most enjoyed the quick response time of the chatbot (n = 5). Participant 8 (P8): "[The CTC] gave some useful advice and was fast at replying!". A couple felt that the response time of the CTC was too slow (n = 2). P4: "…faster response time from the bot would be good". P6: "There is a slight delay in the response".

Some participants appreciated the convenience of CTC (n = 5). For most, it was due to CTC being easily accessible (n = 4). P11: "It answered me fairly quickly. It is easily accessible and familiar (as it is on messenger, an app I already have and use)". A participant provided extensive feedback on the experience and suggested that therapists use this CTC alongside traditional therapy or preliminary examination. P12: "The ease of use and accessibility will mean more individuals will be able to take advantage of constructive and positive advice"; "for the time being, I believe the chatbot should be used in conjunction with traditional treatment and certainly as a preliminary tool". CTC's convenience was met with a privacy concern by a participant (n = 1). This concern is explicitly related to a lack of data transparency and privacy policy, causing them to lack trust in the CTC. P4: "Privacy. Nobody wants to give away sensitive information". The participant's comment was related to the format of this treatment rather than the transparency of this study. They were informed about how their data would be used before the treatment.

4 DISCUSSION

The objective of this study was to determine the suitability of using CAs for single-session, individual therapy for couple problems using CBT principles. By exploring the themes of this study, insights may be extrapolated to inform new CA designs that address the needs of distressed couples.

Participants appreciate the human-alternative aspects of CAs for couple therapy. A participant asserted that simply having an emotional outlet to "vent issues or frustrations" was valuable. This finding aligns with Fitzpatrick et al.'s study, where several participants appreciated an empathetic CA with a personality [5]. Many participants perceived CTC's responses as generic, robotic, or lacking empathy. A participant was particularly displeased with the experience, as they encountered difficulty in "creating a deeper, meaningful and emotional connection" to the CA. They stressed that "there needs to be some empathy" in an application that delivers psychotherapy in this format. Utami and Bickmore reported that couples were emotionally engaged and openly intimate when experiencing digital therapy together [16]. It suggests that an individual format of couple therapy resulted in a perceived emotional disconnection.

Most participants valued Quality responses with deep and meaningful insights. This theme supports that PocketBot's "deep-talk" feature successfully enabled learning opportunities for partners. It encouraged CA capabilities that enable deep and meaningful conversations in couple contexts [19]. In a psychotherapy context, the finding also reinforces that SST improves participant perceptions of mental well-being [20]. The responses were too repetitive for some participants, potentially caused by following the ABC structure while delivering CBT. When a new conversation cycle begins, the CA would repeat the dialogue used in the previous cycle to begin a new ABC cycle. There appears a need for more personalised, varied, and human-like responses as part of the conversational repertoire to reduce the sense of repetition perceived by participants. Participants tend to appreciate a dynamic CA. This appreciation was noted by Inkster et al., as there was a reported repetition in CA's responses [10]. The highly structured formulation of responses required for CBT applications limits the potential response variety. Generating a rich repository of responses that comply with CBT principles is needed. A significant challenge for future studies is to improve flexibility in the response structures whilst remaining methodical and consistent with CBT principles. Early problem resolution before adequate problem discussion is a significant issue for studies aiming to utilise CBT principles in CA applications. CBT is a problem-focused therapy method [12]. Therefore, there must be a methodical approach to determine when the questions will conclude and when the disputing of the identified

core belief will commence. If the researcher does not control this variable, some participants may express that the CA is too repetitive, and others will say it ends prematurely. The wizard experienced this concern during the study. P1 would not state a precise phrase that identified their core belief and instead cycled with phrases such as "I just do not think it is good". This lack of clarity made the wizard continue probing, and P1 consequently believed that the CA was stuck in a loop. Another Wizard-of-Oz study identified a similar problem: the participants highlighted that the CA could not infer meaning beyond the literal conversation. One participant mentioned that it merely repeated their problem rather than expanding on it. The authors used a similar method of template substitution, where pre-written scripts would have variables injected in real time by the wizard. They encountered similar challenges with the Wizard-of-Oz framework, where their scripts were limited in flexibility and usefulness during the treatment. The study suggested that future works could explore conversation recollection, support empathy and shared experiences to improve their paper's limitations [25].

The findings suggest that response timeliness is essential to suitability for CA couple therapy. Most participants were satisfied with CTC's response time, but a couple reported it was slow. The delays were primarily due to the Wizard of Oz approach requiring manual response processing. This finding contradicts Utami and Bickmore's paper, as their participants tolerated the delay required for processing responses. Their study also utilised a Wizard of Oz approach for natural language processing and end-of-dialogue detection [16]. Future studies that use fully automated couple therapists could provide faster experiences, eliminating this impact.

5 LIMITATIONS

This pilot study aimed to provide preliminary findings on the suitability of couple therapist CAs and extend current efforts to automate couple therapy. The cohort was conveniently sampled with limited screening, and the sample size was relatively small. Future studies using more automated CAs with a screened and larger cohort of users are required to evaluate efficacy.

6 CONCLUSION

Our initial findings suggest that using CAs for individuals with relationship problems can be suitable for delivering CBCT therapy and may help mitigate relationship dissolution. This conclusion is aligned with the findings of other studies that have explored the suitability of digitally automated couple therapy. Further, it suggests that individual couple therapy can be a direction for future CA couple therapy studies. CAs should be capable of responding with empathy while exercising competence in dialogue management. Improving the richness and variety of CA responses without violating CBT principles is a challenge that future studies could address. To evaluate the efficacy, future work on CAs for couple therapy could implement fully autonomous CBCT CAs, and evaluate them against larger, more diverse and screened samples.

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