TogetherReflect: Supporting Emotional Expression in Couples Through a Collaborative Virtual Reality Experience

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Figure 1: TogetherReflect is a multi-user VR app designed for individual and collaborative emotional expression about shared conflicts through 3D drawing, tailored to people in romantic relationships. The image shows a collaborative drawing by pair 9.

Abstract

Navigating emotional conflicts within relationships can be challenging. People often struggle to express their emotions during a conflict, which can lead to misunderstandings and unresolved feelings. To facilitate deeper emotional expression, we developed TogetherReflect, a multi-user Virtual Reality (VR) experience designed for couples. Partners first draw their emotions related to a shared conflict in VR, allowing for individual expression and self-reflection. They then invite each other into their drawings to discuss their feelings, before drawing together on a shared canvas to reaffirm their love and commitment. Throughout this process, TogetherReflect provides prompts and guidance, aiming to foster self-reflection and communication skills. We exploratory evaluated the experience with 10 couples (n=20). Our findings indicate that TogetherReflect deepens personal emotional insights, fosters mutual understanding, and strengthens relational bonds. We highlight the potential of guided VR experiences to transform conflict resolution in intimate relationships and offer design considerations for future development.

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CCS Concepts

• **Human-centered computing → Human computer interaction (HCI)**; **Virtual reality**; *Empirical studies in HCI*.

Keywords

Virtual Reality, couples, relationship, conflict resolution, emotional expression, multi-user

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1 Introduction

Emotional expression is key to a successful and long-lasting romantic relationship [34, 45]. However, emotional expression, encompassing identifying and communicating emotions, is often challenging due to varying levels of emotional openness and reflectiveness [87]. Further, verbal discussion as a traditional communication method often fails to fully capture the complexity of emotions involved in conflicts, leaving room for misunderstandings and unresolved tensions [28, 91]. In light of these challenges, there is a need for novel, creative approaches that enable couples to express their emotions more fully and facilitate mutual understanding [5, 28].

A technology that could provide this level of creativity to support emotional expression is Virtual Reality (VR). HCI research has only recently begun to explore this topic in depth [41, 51]. Within that limited body of research, studies have explored 3D modeling for emotional expression [97], creative expression for people with dementia [17], as well as VR drawing to express positive affect [107] or to discuss conflicts, albeit for teenagers [102]. However, only limited research has explored facilitating self-expression through VR for people in romantic relationships. While some real-life conflict resolution methods such as self-expression through 2D creative means as used in art therapy could offer such a creative approach, VR allows for controlled yet immersive environments [59], blocking out distractions from the real world. It offers a beneficial neutral space, which helps to create psychological distance from the conflict, allowing individuals to engage with a clearer and calmer mindset, free from the emotional charge of the original setting (e.g. [106]). Further, users can physically move through the 360-degree space, and by changing perspectives spatially might gain new mental insights as well (e.g. [108]). Moreover, it provides great potential for customisation to match personal preferences, allowing for creative expression through dynamic elements and metaphoric actions that are not possible in reality, for instance through objectification and manipulation (e.g. [12, 36]).

Additionally, in supporting users in managing everyday conflicts [1, 44], reflection can play a central role. Although technologies for reflection exist [31, 53, 100], many approaches could be extended by focusing more on abstract expression [8] and experiential approaches [1], which could facilitate managing emotions as a complex construct. To facilitate reflection and avoid users from being caught in negative thought cycles (i.e. rumination) [29], scaffolding processes and guidance are needed [100]. While integrating such guiding prompts has been found to encourage users to explore and take on new perspectives [15, 52, 56, 84, 93], only a few have looked at integrating voice-based guidance in VR to scaffold the reflection process of complex open-ended tasks [108], albeit not for couples and conflicts in a relationship.

Addressing these research gaps, we developed TogetherReflect – an interactive multi-user VR experience that encourages emotional expression and shared reflection through an open-ended yet guided immersive environment. Inspired by principles of Positive Psychology [13] and art therapy [64], in TogetherReflect, couples are invited to visualise and express their emotions concerning a shared but already resolved conflict. Each partner first individually draws and reflects on their emotions within the virtual space. Then, they invite each other into their emotional landscapes to discuss these feelings, before collaboratively drawing on a shared canvas to reaffirm their feelings towards each other. Throughout the entire intervention, the system provides prompts for reflection and deeper communication.

Specifically, our research is guided by the following two research questions (RQs):

- RQ_1: How can a VR application for visual and verbal externalisation of emotions, guided by voice-based prompts, affect emotional expression for people in romantic relationships?
- RQ_2: How does TogetherReflect facilitate reflection and perspective-taking?

To evaluate TogetherReflect, we conducted an exploratory user study with ten couples, thus $n = 20$ participants. Our findings suggest that TogetherReflect reduces negative affect and strengthens the emotional bond between partners. Furthermore, it empowers users to express their emotions more freely. Participants reported gaining a deeper understanding of the underlying causes and dynamics of their conflicts. TogetherReflect encouraged couples to reflect on themselves, their partner's personality, and their relationship, leading to increased appreciation of their individual differences and discrepancies. We want to emphasize that TogetherReflect is not intended to replace real-world communication or professional couples therapy. Instead, our approach seeks to broaden the range of possibilities for conflict management. For example, in regard to mindfulness, individuals can find support through various means, such as mobile applications (e.g., The Mindfulness App), wearables (e.g., breath monitoring in smartwatches), Netflix tutorials (e.g., Headspace Guide to Meditation), VR experiences (e.g., ReMind VR), and structured programs like counseling or therapies (e.g., Mindfulness-Based Cognitive Therapy, MBCT). However, approaches to and opportunities for conflict management remain somewhat limited, especially when it comes to navigating complex, open-ended personal situations like the emotions within a conflict in romantic relationship.

This paper contributes the following: (i) the design and implementation of TogetherReflect – a virtual environment with the aim to support emotional expression and reflection guided by voice-based prompts; (ii) an exploratory user study to evaluate TogetherReflect; and (iii) design recommendations for VR applications

that aim to support people in romantic relationships to more effectively express their emotions and to better understand and manage relationship conflicts.

2 Related Work & Background

The background and related work section discusses relevant literature to contextualise our work. First, we examine the role of emotional expression and reflection in romantic relationships, highlighting how effective communication of emotions is crucial for maintaining relationship quality. Then, we review various methods for emotional expression, including visual arts and therapeutic practices, and their impact on personal and interpersonal understanding. Furthermore, the section explores the use of Virtual Reality (VR) as a novel medium for enhancing emotional expression and conflict resolution, discussing existing VR applications and their limitations in addressing complex interpersonal dynamics.

2.1 Reflection & Emotional Expression in Relationships

Emotional expression entails the communication of inner emotional states to others[38]. To define emotions, this paper follows notions of the Circumplex Model of Affect [79], classifying them in regard to their valence (pleasure to displeasure), which describes the attractiveness of an event, and arousal (high to low), referring to the level of being physiologically and psychologically stimulated and alerted by them [79]. To express emotions, people can use both verbal and non-verbal modalities, as well as more complex behaviours, such as writing or drawing emotions [37]. Expressing and thus reflecting on oneself can help people understand challenging and emotional events better and provide new perspectives when comparing with others' behaviour [14, 62, 100]. Thus, emotional expression is a concept central to numerous therapeutic approaches, particularly art therapy, where emotions and past experiences are expressed visually to facilitate reflection [64]. The resulting visualisation then offers a tangible object as a reminder, and potentially as a conversation starter about emotions [24].

Reflection is defined as an introspective process where individuals critically analyse their thoughts, feelings, and behaviours [35]. Thus, reflection forms the basis of understanding emotions before being able to communicate them effectively to a partner. Reflection is often divided into reflection-in-action [94], which is a spontaneous ability to "think on our feet" during an experience [94]. In contrast, reflection can also happen in retrospect after the action has been concluded, called reflection-on-action [94].

The process of visually expressing emotions, i.e. drawing, can create positive affect, a notion which is exemplified by the Expressive Therapies Continuum, a foundational framework in art therapy [48]. As such, even seemingly aimless art activities such as doodling can be considered contemplative self-care activity [19, 96]. It can support both hedonic well-being, associated with activities that promote happiness, and eudaimonic well-being, which involves personal growth, skill acquisition, and the search for meaning in life [26]. For example, the expression of negative emotions has been shown to aid in emotional regulation [37, 49], leading to cognitive changes that subsequently enhance subjective well-being—essentially, an individual's overall life satisfaction [27, 76]. Furthermore, the sharing of emotions can foster new relationships and strengthen existing ones [34]. It is critical, however, that the listener demonstrates empathy when engaging in emotional disclosures [76].

In this study, we focus on emotional expression through three distinct steps: visualising emotions via drawing, engaging in verbal discussions, and integrating these methods in collaborative settings. We investigate how VR-mediated emotional expression, encompassing both visual and verbal components, impacts interpersonal relationships and fosters mutual understanding between couples.

2.2 Conflict Management and Emotional Expression in Relationships

The perceived quality of romantic relationships, which is the subjective assessment of the relationship being good or bad, can influence people's well-being, mental and physical health, and job performance, amongst others [45]. While a lot of factors affect relationships, some predictors encompass perceived partner commitment and perceived partner satisfaction, as well as conflict (management) [45]. Stressors for relationships are mainly connected with emotional problems that are shown in experiencing, expressing and handling of emotions [87], highlighting the need to constantly re-evaluate and work with emotional expression. To that end, research emphasises the need to process emotions on an interpersonal level, meaning offering and receiving support [87]. This includes understanding own affective states and the ones of the partner, being able to address and communicate those, as well as mutually supporting the partner in reducing negative affect [87]. Similarly, it is important to express appreciation and pride towards each other, make time for each other in daily life, work together as a team, see aspects from the other's perspective, consider each other's feelings and work through conflicts together [33].

However, traditional communication methods to express emotions, such as traditional verbal communication, often fall short of conveying the complexity of emotions [28]. This often leads to misunderstandings and conflict escalation [91]. Many people struggle with articulating their emotions verbally [5], highlighting the need for alternative methods for emotional expression such as visual and creative tools for more successful conflict resolution [5, 28].

Based on the importance of these aspects in romantic relationships, TogetherReflect aims to provide creative means for emotional expression, supporting intra- and interpersonal identification and communication of emotions to the partner.

2.3 VR-Based Emotional Expression

Only a few studies specifically aim to support couples in aspects related to their relationship quality and conflict management. In that regard, most focus on exploring long-distance relationships, for instance through providing loving-kindness VR meditation applications [110]. Others have developed hugging experiences to increase social bonding in such settings, albeit not for couples [32]. VR was also used to facilitate perspective-taking and conflict resolution through retrospectively embodying oneself and a close friend or family member, which was found to be more effective than watching 2D recordings of the conflict [114].

Furthermore, there has been limited research on how VR can be utilised for emotional expression. In a scoping review on VR usage to promote positive change from 2018 [51], only 2 out of 33 publications in HCI aimed to facilitate self-expression. Although since then the interest in that area has increased, exploring the benefits of doodling in reality [19] or finger painting in AR [58], 73% of papers in 2023 exploring VR for self-expression were published between 2020 and 2022 [41]. Research has shown that art making in VR has similar benefits as 2D drawing, including reduced heart rate and skin conductance, decreased stress and anxiety, and an increase in positive affect [89]. Thereby, VR provides unique engagement opportunities not possible in reality [39]. To elaborate, VR evokes strong emotional responses through a sense of presence [90], creates immersive and distraction-free environments [59], utilises dynamic elements and spatial distancing to convey meaning [108], and allows users to physically explore and engage with environments from different perspectives [108]. So far, these capabilities have primarily been employed to evoke emotions [77, 104], particularly in areas such as exposure therapy [68], positive change initiatives [51], mindfulness practices [81, 105], relaxation techniques [78, 88], and stress management [98].

In contrast, fewer VR applications have been designed specifically for expressing and reflecting on emotions. To provide some examples, Wagener et al. [107] tested a tool palette for VR drawing inspired by OpenBrush and found that this approach of providing autonomy in the design process of a VE accommodates users in visualising affective states and in reflecting on previous experiences by drawing in VR. Cheung et al. [17] empowered people with dementia to collaboratively create art expressing their emotions using VR. A larger body of literature in VR has explored its employment for emotion regulation practices, albeit not in an interpersonal setting [73, 82, 106, 109]. Further, it has been used for creative expression in art therapy [39, 40, 64].

Two studies particularly relevant for TogetherReflect are by Semsioglu et al. [97] and another paper by Stefanidi et al. [102]. Semsioglu et al. [97] examined collaborative emotional experiences by allowing pairs to explore each other's expressive drawings in VR for reflection and communication. They found that representing emotions in a collaborative multi-user environment can improve the communication between the collaborating individuals. However, this study did not focus on discussing conflicts within romantic relationships, limited expression to 3D sculpting of VR islands rather than free creative expression, and lacked a joint activity component. Another notable example is by Stefanidi et al. [102], exploring emotional expression by visualising emotions regarding a conflict in VR. However, they tested this setup with teenagers and teenagers, and with teenagers and their parents, not with adult participants in an amorous relationship. Additionally, they recommended providing guidance to enhance the reflective process, which was not offered in their experience.

Building on this previous research that employs VR as a medium for externalising and visualising emotions, we aim to leverage VR's affordances to foster positive affect, reflection, and communication. Thereby, our specific focus lies on people in a romantic relationship experiencing common everyday conflicts with their partner.

2.4 VR-Based Voice Guidance

Creative expression in VR can be overwhelming, as not everyone finds it easy to open up and express their emotions [86]. Individuals participating in VR-based creative self-expression must first recognise the emotions they experience and determine how to represent, express, or communicate these feelings both internally and externally to others. To aid in this self-reflection process, previous studies recommend employing moderately directed guidance [18, 21, 100].

This guidance can be delivered through conversational interfaces, such as chatbots or voice assistants. Research has shown that these systems can be specifically designed to assist users in navigating complex tasks and provide "scaffolding" for cognitive processes [30, 84, 85, 112]. Additionally, such technologies have proven beneficial in facilitating reflection with the goal of enhancing well-being and mental health [3, 15, 52, 56, 57, 63, 80].

Nevertheless, a direct one-to-one transfer of human-to-human guidance in creative, educational, or therapeutic contexts to VR is challenging due to the inherent differences in characteristics and user interactions of VR. The immersive nature of VR alters the way individuals engage with their creations, making it challenging to foresee how existing guidance methods would adapt and integrate into the user's creative process effectively. To that end, work by Wagener et al. [108] has explored the design and impact of voice-based guidance in VR. They found that prompts need to be encouraging and inspiring, providing specific examples for voice-based guidance when reflecting on challenging events. While building on their concepts of designing voice-based guidance, TogetherReflect differs by providing multi-user scaffolding, guiding through each stage of the system, prompting both individual reflection as well as guiding through the discussion phase of a shared conflict within the relationship.

3 TogetherReflect

TogetherReflect is a multi-user VR experience designed to offer a wide variety of possibilities to express emotions while guiding users through the experience with prompts that encourage reflective processes. We envision it catering to couples interested in developing and practising emotional expression skills. Nevertheless, we restricted participation in our study to conflicts that had already been resolved due to our ethical responsibility to avoid potential risks of rumination as we evaluated the prototype. Given the diverse nature of conflicts in romantic relationships and the different personalities involved, the design of TogetherReflect had to be carefully crafted. Therefore, it is inspired by prior literature and rooted in established psychological theories. A comprehensive explanation of the design rationale will be provided in this section.

3.1 Supporting Emotional Expression in VR

The design of TogetherReflect is inspired by artistic self-expression as used in art therapy [61, 64]. This method promises a contemplative, meditative and engaging activity that can lead to flow [20], elicit positive effect [46], foster reflection [48], and improve self-efficacy [50] (the belief and confidence in one's ability to complete tasks, achieve goals and handle similar situations in the future in a better way [4]). Thus, TogetherReflect offers the 3D space and a specific tool palette to cater for artistic emotional self-expression.

We compared the tool palettes offered by Semsioglu et al. [97], offering a 3D modelling tool, and Wagener et al. [107], offering drawing tools and 3D sculpturing tools, and decided to adapt the latter, as it provides the most autonomy without overwhelming users. It is thus aligned with our goals for TogetherReflect. The tool palette used in TogetherReflect to create individual environments consists of twelve animated and non-animated brushes, a colour panel with infinite colours, and a tools panel to erase, re-colour, and retrieve steps. Due to the multi-user setup, both participants sharing the same real and VR space, we could not offer selecting pre-set environments and adjusting the lighting, as this would affect the partner's VE as well.

3.2 Supporting Reflection Through Voice-Based Guidance

Additionally, TogetherReflect offers voice-based guidance. Its design is inspired by prior literature suggesting that moderately directed guidance helps with reflection [18, 21, 100]. It follows conceptualisations by Wagener et al. [108]. They found that VR-based voice guidance should adapt to changing user needs, providing hands-on and high-level reflection probes, encouragement for abstract expression and reflective stimulation. In contrast to their setup, though, our guidance was only provided when requested by the users by pressing a button on the controller. This decision was based on the dichotomy between reflection on the one hand, and engagement and flow on the other. To elaborate, reflection needs to be encouraged [100], and can have many positive outcomes [71] as it can lead to more self-insight [7], support life changes [101], and benefit health, well-being and personal growth [14, 62, 100]. On the other hand, reflection also requires effort, which can decrease the enjoyment of the task and lead to a loss of motivation. Yet, high engagement can lead to a state of flow, where users become fully immersed in the VR experience, feeling effortless focus [74, 95], which can result in positive emotions [22] and can positively influence the intention of continued use of VR applications [42]. Given this dichotomy, we decided to provide the autonomy to the users to individually decide when guidance was needed. Additionally, it was mandatory to use voice-based guidance at the beginning and when finishing each phase (Individual Drawing, Discussion, Collaborative Drawing). This was to guide users through the experience and provide at least one inspirational prompt per phase. Table 1 provides some example prompts; the full list can be found in the Supplementary Material.

3.3 Final Prototype

TogetherReflect differs from other work by combining a multi-user setup for facilitating reflection and conflict management while being guided by voice-based prompts designed specifically for couples. Table 2 provides a simplified overview of the components and elements that TogetherReflect offers in comparison to other relevant related work that provide means for creative self-expression of emotions. For instance, we chose a similar approach to prior work to autonomously creating virtual environments through providing a diverse tool palette, which was inspired by former Google's Tilt Brush, a room-scale 3D painting XR application. The tool palette

Figure 2: The menu for the tool palette is attached to the left controller and consists of these three panels, which are arranged in a triangular format and can be scrolled through using the controller's thumbstick. A press of the A or B button on the controller triggers the next prompt.

used in TogetherReflect allowed users to choose from innumerable colours to draw in, a selection of twelve brushes, some of which were animated such as stars or bubbles, and some basic tools such as undo, redo and re-colour (see Figure 2). We combined this tool palette by adding guiding prompts as suggested by Wagener et al. [108], and specifically framing TogetherReflect as a multi-user tool to facilitate emotional expression, reflection and conflict management specifically for couples. This combination of features creates a unique VR experience, called TogetherReflect.

The technical setup requires two wireless Oculus Quest 1 headsets and one PC, all of them being in the same network. To allow for a multi-user setup, both VR headsets acted as clients to a Unity server running on a computer within the same network. The positions of the VR headsets and controllers, the drawings, and the wall visibility were synchronised between the clients. To facilitate the synchronisation of drawings, a FileZilla FTP server was used to store the drawings and mirror them back to the other user.

4 Evaluation

We evaluated TogetherReflect through an exploratory VR study with ten couples, thus $n = 20$ participants. As TogetherReflect targets VR users seeking everyday support in expressing emotions and managing conflicts, we recreated a setting similar to an at-home environment. However, following considerations by Ratcliffe et al. [83], a true remote VR study setup was challenging due to the rather complicated technical setup, the user group being relatively inexperienced (see Table 3), and the need to ensure comparability of results. Thus, the study was conducted in a laboratory space but without the researcher being present during the actual study. This guaranteed privacy and allowed for focused interaction with the task, mimicking an at-home setup. The study received prior ethics approval from [blinded for review].

Similar to other related works (e.g. [17, 81, 97, 102, 108]), we adopted an exploratory approach because comparing to conventional baselines introduces several confounding factors. For instance, it goes beyond translating art therapy into VR, extending previous research in this regard (e.g. [39, 40]), combining drawing

Table 1: Example prompts from the three separate phases of the TogetherReflect experience.

Phase	Example Prompt	Purpose
Individual Drawing (Welcome)	Welcome! First, think about how you felt at the beginning when you initially faced this resolved conflict. Now, try to express this feeling where you are currently standing. Choose a suitable colour and type of brush that you feel matches this feeling best, and then colour the space around you. Remember, there is no right or wrong—what you do only needs to feel right to you! Once you have done that, you can press one of the buttons to move on.	Hands-on scaffolding; easing users into the experience and preventing 'blank-page syndrome'.
Individual Drawing (Free Flow)	What was an important emotional aspect of the part of the resolved conflict you are currently expressing? How could you express it with the different tools, brush types, and colours that are available to you? Try to "relive" each emotion when expressing it visually. I would not spend too long thinking about the best or most accurate way to express something; the most important thing is to just keep drawing.	Facilitating reflection-in-action, high-level reflective scaffolding
Discussion	Walk your partner through your creation, step by step, and explain your drawing. When you walk through the different stages, what do you experience and feel?	Receive thought-provoking questions for reflection-on-action.
Collaborative Drawing	Congratulations on completing this activity in an awesome way! Now you have the option to express how you feel after you have solved the conflict and your feelings towards each other in a shared drawing. You can draw for as long as you want. Enjoy!	Easing users out of the experience, creating a comfortable atmosphere.

Table 2: Elements of TogetherReflect (TR), compared to Mood Worlds (MW) [107], EmotionIsles (EI) [97], TeenWorlds (TW) [102], and SelVReflect (SR), experience.

	Elements of the Experience	TR	MW	EI	TW	SR
1	Choosing pre-set environments		✓			
2	Tool palette for VR drawing	✓	✓		✓	✓
3	Facilitating emotional expression	✓	✓	✓	✓	✓
4	Facilitating reflection	✓		✓	✓	✓
5	Facilitating conflict management	✓			✓	
6	Multi-user setup	✓		✓	✓	
7	supported by guiding prompts	✓				✓
8	Supporting couples	✓				

with other components such as sound, three-dimensional environments, light, animation, and (user) movement [107], and providing voice-based guidance specifically designed for expressive reflection in VR. This, taken together with the unique target group of people in an amorous relationship and the multi-user setup, forms a completely new experience altogether. Consequently, it is challenging to identify a valid baseline for comparison with the prototype. Given the novelty of this experience, it is thus more meaningful to first explore how and what it enables users to create and discover, as we endeavoured to understand in this work.

4.1 Data Collection

Quantitative data was collected from five validated questionnaires. Further, we gathered qualitative feedback from participants to build an in-depth understanding of their experience with TogetherReflect.

4.1.1 Measures. The following measures were administered pre and post study:

PANAS: We used the PANAS questionnaire [111] to measure the affective states of users before and after experiencing TogetherReflect. Participants indicated on a 5-point Likert scale to what extent they felt ten positive and ten negative emotions at that moment. By using this measure, we can assess if TogetherReflect creates positive affect, and reduces negative affect.

BES-A: The Basic Empathy Scale (BES-A) measures empathy specifically for adults [47], with the subscales discerning between Cognitive Empathy (CO) and Affective Empathy (AF).

SITES: The Single Item Trait Empathy Scale (SITES) [54], measuring empathy with a single item.

IRIC: Interpersonal Reactivity Index for Couples (IRIC), measuring empathy [25, 75]. Empathy here is measured with four subscales, of which two were administered due to fitting best to our setting: Empathic Concern (EC) and Perspective Taking (PT).

SRIS: The Self-Reflection And Insight Scale (SRIS) measures levels of reflection [35], with the subscales Self-Reflection (SR) and Insight (IN).

4.1.2 Interview Protocol. We conducted joint semi-structured interviews averaging $14:52$ minutes (min: $8:53 minutes$, max: $22:47 minutes$, sd: $04:42 minutes$) where both participants were interviewed simultaneously to facilitate shared insights.. Participants discussed their emotions, thoughts, and reflective processes experienced during the study. They focused on their emotions and thoughts during the individual VR drawing, as well as when visiting each other's drawings. Additionally, they reflected on their conflicts and their overall experience with TogetherReflect. The full interview protocol is available in the supplementary material.

4.2 Participants

We recruited an overall number of ten couples, this $n = 20$ participants. The participants were recruited through our extended social network and snowball sampling. Our sample consisted of 9 females and 11 males with an age range from $min: 23$ years and $max: 53$ years ($M = 32,25$ years), see Table 3 for details.

4.3 Procedure

Each pair of participants was provided with two laptops for completing the questionnaires and two wireless Oculus Quest 1 headsets for the duration of the study. These items were supplied solely for

Table 3: Participant sample: ID's have been reassigned for anonymity.

Pair	P-ID	Gender	Age	Nationality	Relationship Length	Conflict Scenario	VR Experience
A	P1	Male	27	German	4 Years	unspecific conflict	Regulary
A	P2	Female	27	German	4 Years	unspecific conflict	A few times
B	P3	Male	33	Nepali	2 Years	unspecific conflict	Occasionally
B	P4	Female	31	German	2 Years	unspecific conflict	Occasionally
C	P5	Male	29	Nepali	4 Years	ignoring the partner	Occasionally
C	P6	Female	27	Nepali	4 Years	ignoring the partner	Occasionally
D	P7	Male	35	Egyptian	2 Years	unspecific conflict	None
D	P8	Female	26	Iranian	2 Years	unspecific conflict	None
E	P9	Male	53	German	20 Years	behaviour when having a baby	a few times
E	P10	Female	46	Austrian	20 Years	behaviour when having a baby	None
F	P11	Male	27	German	6 Years	balancing work with social obligations	one time
F	P12	Female	27	German	6 Years	balancing work with social obligations	two times
G	P13	Male	28	German	7 Months	emotional reaction when playing games	few times
G	P14	Female	23	French	7 Months	emotional reaction when playing games	None
H	P15	Male	25	German	4 Months	misunderstanding of a comment	Developed one VR Game
H	P16	Female	25	German	4 Months	misunderstanding of a comment	None
I	P17	Male	40	German	8 Years	using the dishwasher	None
I	P18	Male	38	German	8 Years	using the dishwasher	None
J	P19	Male	26	German	2 Years	misunderstanding of a comment	Few times
J	P20	Female	30	Chinese	2 Years	misunderstanding of a comment	Worked with VR for 1 year

use during the study. The headsets were chosen for their ease of use, which did not restrict physical movement. The studies were conducted in a room measuring $4m$ by $7.5m$ ($30m^2$).

Before the study, participants provided consent, gave demographic data, and chose a shared conflict to use during the study. They were asked to re-enter a similar emotional state as in their remembered conflict with their partner. To that end, we used the method of an Autobiographical Emotional Memory Task (AEMT) [69], a validated method to induce emotions. This mood-congruent procedure prompts participants to recall and write about recent situations, thereby increasing the likelihood of re-experiencing strong emotions associated with that situation [6, 70]. Participants followed the AEMT guidelines by describing how they felt in detail during their shared conflict. The AEMT is widely used in HCI for this purpose (e.g. [99, 102, 106–108]). Participants then completed the PANAS, BES-A, SITES, IRIC, and SRIS questionnaires. Next, they were shown the specific controls of TogetherReflect (e.g. brush modification) by the researcher and had time to familiarise themselves with the drawing functionalities in VR. They then started TogetherReflect, consisting of the following phases (also visualised in Figure 3):

- **Individual Drawing:** The participants entered VR, sharing the virtual space, separated by a virtual wall. They were asked to draw individually, representing a resolved conflict from their personal experiences. During this phase, participants were guided by pre-recorded prompts.
- **Discussion:** Once both participants finished their individual drawings, the virtual wall disappeared, allowing them to view and discuss each other's work. They were guided by pre-recorded prompts.
- **Collaborative Drawing:** They were then asked to collaborate on a joint drawing, expressing their shared emotions after the conflict was solved and visualising their feelings towards each other. This phase was again guided by pre-recorded prompts.

After the study, participants called the researcher back into the room, and filled out PANAS, BES-A, SITES, IRIC, and SRIS again. They then took part in an exit interview. On average the participants spend 45 : 49 minutes in VR (min: 14 : 54 minutes, max: 1 : 12 : 47 hours, sd: 19 : 06$minutes$).

4.4 Data Analysis

For our qualitative analysis, all audio recordings of both the study and the interviews were transcribed verbatim and subsequently imported into Atlas.ti software. Initially, two authors conducted open coding on a subset of interviews, collaboratively developing a coding tree through iterative discussions. The remaining transcripts were then coded by one author, applying the predefined coding structure. In a final discussion session, the two authors used thematic analysis to identify overarching themes [11]. To further enhance understanding and support theme development, one author revisited each recording of the VR drawing of each participant, enriching the analytical process.

For our quantitative analysis, the Shapiro-Wilk statistic and visual inspection suggest not normally distributed data, thus we used non-parametric tests. We used the one-way repeated-measures ANOVA on aligned ranked transformed data (ART-ANOVA) [113]. This is a non-parametric approach specifically developed for Likert-type data. We used it to compare the factor *pre* vs *post* measurement of all questionnaires (PANAS, BES-A, SITES, SRIS, IRIC) in our within-subject study design.

5 Findings

Based on the evaluation, we gathered qualitative insights from the post-study interviews and recordings of the study, i.e. the discussion and mutual drawing phases. We collected quantitative results from the questionnaires administered pre- and post-study.

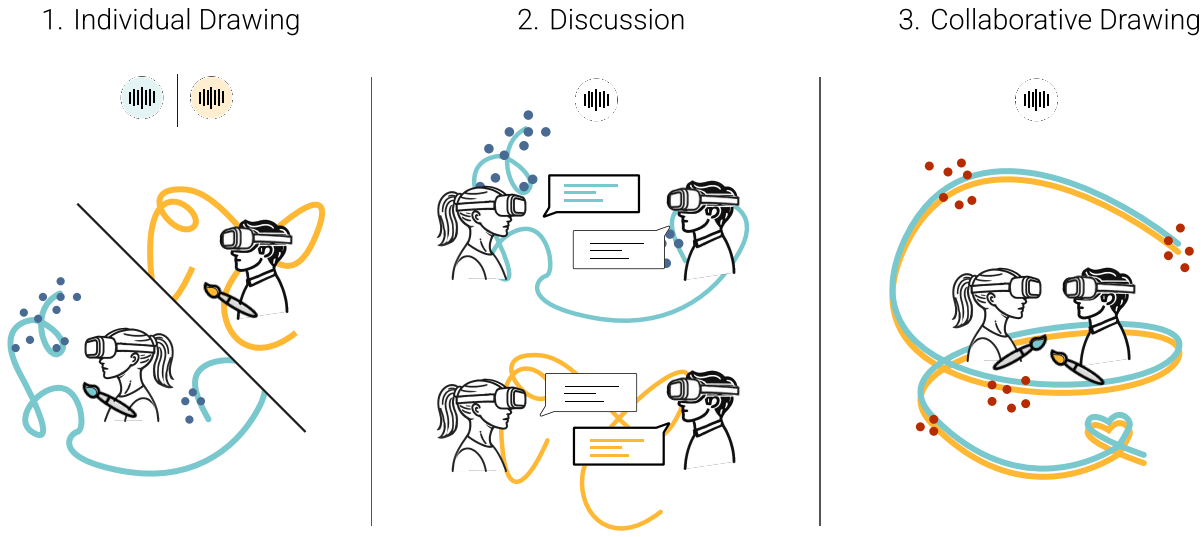

Figure 3: Procedure of TogetherReflect. First, they create separate drawings while having a virtual wall in between, being individually guided by voice-based prompts if needed. Then, they invite the partner into their drawing and discuss it, being mutually guided. Lastly, they create a mutual drawing, expressing their emotions towards each other.

5.1 Qualitative Findings

Based on our qualitative inquiry, four themes were derived from the data: *Disentangling the Conflict and Self-Determination*, *Reflection and Perspective-Taking*, *Celebrating Diverse Approaches*, and *Hedonic Experience for Connecting*. Our findings are described below and illustrated with excerpts from the interviews.

5.1.1 Disentangling the Conflict and Self-Determination. The first theme focuses on the specific setup and tool palette of TogetherReflect, which can empower users to better understand the conflict, its triggers and components, as well as their own needs, and thus become determined to hold their own in a discussion. It encompasses the codes *Disentangling Triggers and Components*, *Visualising Importance and Emotions*, and *Supportive Space*.

The diverse tool palette of TogetherReflect also allows users to find a new approach to understanding the conflict. Inspired by the VR-based guidance, some users split the conflict into several stages, simplifying it in the process. They thought more in *"patterns"* (P8) or *"storyboarding"* (P19), drawing *"panels"* (P19) and ordering the different stages in chronological order. They explained that this process of sequencing, dividing the conflict into separate *"chapters of our own small drama"* (P15), empowered them to *"step forwards and backwards through time in the drawing"* (P10) and thus to evaluate their feelings in regard to smaller parts of the conflict than the conflict as a whole.

To express those emotions in regard to the smaller stages of a conflict, participants emphasised the benefits of having many different options provided by TogetherReflect's tool palette. One of these was colours. To that end, P19 of pair 9 used Yellow and Blue to refer to emotional aspects belonging to each of them, and the combination of both (Green), for elements concerning both to them. Others used colours to encode emotions and a *"true meaning"* P6. Interestingly, colours were not that often used to represent a specific emotion or a valence, such as red for anger. Instead, they often represented the state of arousal. To that end, the animated brushes were also often chosen. One participant clarified:

> *"Anger would be one of those more active brushes like there's a fire brush; I would use that to represent anger or enthusiasm, the energy that goes into something, whereas you have more simplistic brushes and colours for calm feelings. [...] If it's sparkling, there's a meaning to it. If it's simplistic, dark, it doesn't really matter to me."* (P11)

Additionally, participants also highlighted that being able to draw in a 360° space and move through the drawing was beneficial to express emotions, empowering them to better express the messy nature of emotions, compared to other forms of media. P13 explains it as follows:

> "I got more into depicting emotions, like, more just the turmoil that comes with shapes, that you can have smoke and just chaos if you feel like having an emotional chaos, instead of just using faces [emojis]". (P13)

By using the diverse tool palette to visualise emotions in VR, participants were provided with the space to unfold their own creativity. In particular, the initial *Individual Drawing* phase helped them to connect with their emotions, creating a comforting and *supportive space* where individuals can unwind. This was important as they reported first feeling insecure how to proceed, but being alone in an empty space helped them to gain confidence.Having the opportunity to first engage privately with their thoughts and emotions and express those seemed to be particularly important for partners who tended to be more subdominant in their everyday lives, empowering them to hold their own in the following

Discussion phase. One participant exemplified this sentiment by sharing:

> *"You create something in your safe space, which is then immutable at that point. So, [in real life] you would start explaining yourself and then, when you see that the partner's reaction is not what you expect or if the pressure on you is too high, you would stop or relativise things. Now you completed everything, you told the complete story, and then you deliver it, and then it's not going to be changed when the other person is looking [at it]. So, that's very much different to discussing a conflict, because there you try to evade the pressure."* (P11)

With this diverse tool palette, TogetherReflect also allowed participants to find a different form of expressing themselves than verbal communication. Participants remarked that explaining their feelings verbally to their partner is "really complicated" P7. In those cases, TogetherReflect was seen as a support tool to still express oneself. One participant described it as follows:

> "And I didn't feel like talking with him [about] the feelings I could feel. And now I could express those through the virtual environment." (P6)

5.1.2 Reflection and Perspective-Taking. As a second theme, we found that TogetherReflect facilitates self-reflection and mutual understanding. It encompasses the codes *Validating and Reinforcing* and *New Insights*.

Participants noted that TogetherReflect provided them with the opportunity to spend time to reflect which they rarely have in their everyday life. It also provided the space to think about their general personality, their behaviour during the conflict, the character of the partner and their relationship in general. They commented on the benefit of self-reflecting through TogetherReflect for the relationship. One participant reflects:

> "So we have to do more work to understand ourselves and then to understand our partner. Because if you don't understand yourself, it's hard to understand anyone." (P8)

Given that goal, we found that some participants validated and reinforced existing sentiments and beliefs through self-reflection. One participant elaborated on their thought processes during the individual drawing:

> "I again validated what are my priorities. If I am willingly hurting somebody with a compromise, did I think about that? Am I aware of all the consequences of that? Did I take everything into consideration? I validated that during painting and I'm not surprised; I think I made the right decision." (P11)

Moreover, TogetherReflect also facilitated detecting new aspects in regard to emotions, their own or their partner's character. For example, they realised that by thinking about other ways to depict emotions than emojis, they *"now have a better feeling of how emotions kind of feel [...]; it helped me a lot to just understand the brain more"* (P13). Participants realised how subjectively they had visualised the conflict, and thought about different solutions they could have had for it.

Additionally, participants also highlighted that visiting and discussing the partner's drawing made them reflect on their partner's character and personality. This helped to change perspectives and gain insights into the partner's thought pattern. One participant, who had been in therapy for years and had also talked about the conflict with their therapists when it occurred, still found seeing the drawing of the partner extremely helpful to better understand their perspective:

> *"It actually took quite some years in therapy to solve this, and I am still sometimes extremely angry about it. But we managed to go through the conflict, and funnily, the drawing helped right now. His drawing helped because it actually was quite good to see how he sees the situation."* (P10)

Another participant shared that the partner is just not good at identifying and talking about emotions and that, in reality, it is sometimes challenging to understand their point of view. For those pair constellations, TogetherReflect supported them as follows:

> *"[My partner] is not that good in expressing his feelings, not in a structured way so that someone else could understand him somehow afterwards. But for example, I think I can now explain it better, it is detailed, more organised, so someone else can understand him."* (P8)

5.1.3 Celebrating Diverse Approaches. The third theme encompasses the reactions of users towards the differences and discrepancies of visualising emotions and approaching conflicts, highlighting how this strengthens their relationship. We present the codes *Visualising Discrepancies* and *(Re-)Connecting and Reaffirming*.

Participants emphasised that through the diverse tool palette of TogetherReflect they were offered a playful approach to visualising emotions and to the conflict. While this helped to reflect, as previously shown, it was also seen as a "different form of communication" (P1). As an example, one pair used the different brush types, the animated *Bubbles* vs. non-animated and flat *Ducttape*, as proxies to explain how they viewed their partner's personality. They reflected:

> *"But that made it clear again that we are two completely different types to find a conflict solution or to present a conflict solution. I am more the bubbly one who takes a thousand things into action to see what is really the most meaningful and what is the best, what is fastest and most effective. So I take 500 things and he sees it more black and white, just says, yes, the conflict is there, we solve it. Done."* (P17)

Interestingly, participants reacted mainly positively to seeing different forms of visualising the same conflict, as well as towards their discrepancies to dealing with conflicts. They described that this was one strength of TogetherReflect, first to *"especially visualise the discrepancies from our two perspectives"* (P15), and second to support the realisation that this is one reason why they work as well together as they do. One pair phrased it as follows:

> *"It [the conflict] was huge and the results together [drawings in TogetherReflect] were huge, but the difference was huge. Like me and you, the difference was huge, you know?" (P7) "I feel so proud, that we came together.*

> *I was really enjoying that, and I would love to do it again."* (P8)

This shows that as a reaction to these differences, participants celebrated those discrepancies and re-affirmed their appreciation for the partner despite – or because of – the discrepancies. During the study as well as in interviews they complimented each other's drawings, expressed feeling proud of the partner opening up to the emotions, and reported *"warm feelings drawing this together"* (P10). Effectively, this strengthened their relationship. Participant P6 summarised:

> *"[TogetherReflect is] something that really helped us to work on our relationship. And I actually loved working in it to work on it."* (P6)

Und dass irgendwie ich am Anfang dachte, wir hätten dasselbe Wertung auch, oder was uns so prägnant geblieben ist. Dass es unterschiedlich war. 8

5.1.4 Hedonic Experience for Connecting. During the Discussion phase, some pairs critically reflected that for pairs without a stable basis or exploring a yet unresolved conflict, the experience of TogetherReflect might have a negative instead, potentially even intensifying the conflict. Interestingly, participants did not comment on this during the interviews, as these considerations did not reflect their experience with TogetherReflect. For those participants taking part in our study, TogetherReflect was rated as a meaningful activity in itself, although not all of them experienced reflection or gained new insights. This will be presented in this theme, including the codes *Positive Affect*, *Teamwork* and *Quality Time*.

Drawing in VR was intuitive for most participants after getting used to the controls. This led to being immersed in the experience, emphasising a state of flow. One participant put it as follows: *"it's quite fun, and the more you try out, the more you want to continue, because you're trapped in it"* (P14) and others commented that they were surprised about the level of positive valence: *"it was unexpected how much I enjoyed it"* (P12). Further, recordings of the Discussion phase revealed that couples frequently laughed together, often making light-hearted remarks about the simplicity and messiness of the childlike drawings they had created.

Besides eliciting positive affect through VR drawing, TogetherReflect was considered a teamwork experience. Participants interpreted the TogetherReflect experience as a reflection of their real-life teamwork skills, which, in turn, reinforced their sense of being in a harmonious relationship. One participant elaborated:

> *"If we don't try hard to get an understanding for each other, it's hard. But if we are working from the beginning as a team, we see that we are like really team compatible."* (P8)

Moreover, participants appreciated that TogetherReflect offered a shared experience. They enjoyed spending time together and suggested that they would have also liked to just paint in a collaborative manner for 30 minutes without reflecting on a conflict.

5.2 Quantitative Findings

We conducted one-way repeate-measures ANOVAs on aligned ranked transformed data (ART-ANOVA) [113] to study the effect of experiencing TogetherReflect on positive and negative emotions, empathy and self-reflection capability. ART is an analysis method demonstarted to be effective with sample sizes similar to our study [113]. We found a significant effect for the subscale (PANAS Neg), $F(1, 19) = 6.79, p = .02$. Thus, TogetherReflect significantly helped reduce negative emotions for participants (see also Figure 4). The overall results can be found in Table 4.

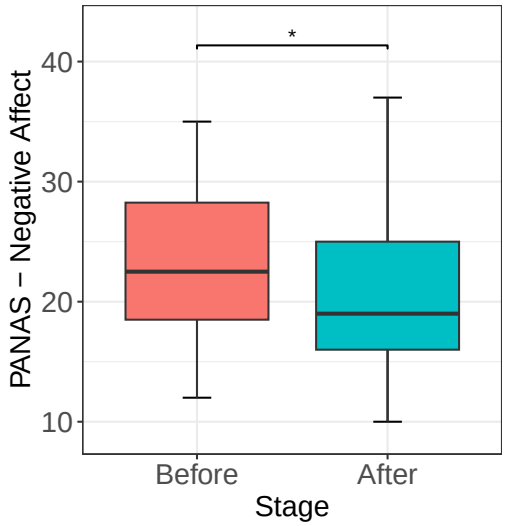

Figure 4: Boxplot showing the significant effect of negative affect comparing *pre* and *post* measurements.

6 Discussion

In this work, we set out to explore the potential of a VR experience that allows for creative emotional expression through guided 3D drawing for people in romantic relationships **(RQ1)**, and its effect on reflection and perspective-taking **(RQ2)**. To answer this question, we developed TogetherReflect, facilitating the expression of and reflection upon shared conflicts within the relationship in a multi-user VR setup. Provided with a palette of tools, the users simultaneously created their own virtual environments, assisted by a voice-based guide that encouraged and supported their abstract expression and motivated them to reflect, then discussed those with the partner before collaborating on a joint drawing. We conducted an exploratory user study with $n = 20$ participants in which we evaluated the effect of TogetherReflect. We found that it significantly reduced negative affect, while participants reported better understanding the conflict, becoming self-determined, and being supported in self-reflection and perspective-taking. Furthermore, it encouraged celebrating different approaches to visualising and expressing emotions which strengthened their relationship.

In this section, we discuss our main findings and show how TogetherReflect relates to and extends existing research. We then outline design recommendations for supporting open-ended, expressive and reflective tasks in VR for couples and reflect on limitations as well as ways forward.

Table 4: Mean values and standard deviations for *Before* and *After* measurements for all questionnaire scales. Significant p-values are denoted with asterisks (*).

	PANAS		BES-A			SITES	IRIC		SRIS	
	Pos	Neg	CO	AF	TOT	TOT	EC	PT	SR	IN
Before	33.30	22.80	39.30	40.00	79.30	4.05	26.65	21.40	56.20	33.70
After	34.45	20.40	38.60	38.65	77.25	4.10	25.55	21.40	55.50	33.75
$F_{1,19}$	1.31	6.97	0.70	2.09	1.39	1.00	3.96	0.00	0.06	0.01
p	.27	.02*	.41	.16	.25	.33	.06	.97	.81	.92

6.1 Reflecting on TogetherReflect

Overall, TogetherReflect was considered a tool supporting discovery. This refers to exploring components and triggers of conflicts as well as better understanding oneself and the partner. Findings presented in the theme *Disentangling the Conflict and Self-Determination* have shown that by providing a diverse tool palette and a supportive space, users were able to playfully express and engage with their own and their partner's emotions. Thereby, TogetherReflect significantly reduced negative affect, both re-affirming notions of the Expressive Therapies Continuum about the nature of artistic expression [48] as well as highlighting aspects of successful interpersonal emotion regulation through emotional expression [87]. This answers **(RQ1)**.

Although our qualitative findings indicate increased levels of empathy and reflective capacities, the quantitative data did not show significant effects in this area. This discrepancy may stem from our small sample size of twenty participants. While this reflects the average used in quantitative analysis within CHI research [16], the findings of the quantitative analysis should be interpreted cautiously. Further, we measured a relatively high baseline of empathy scores of approximately 80 out of 100 prior to the study, which makes it more challenging to achieve even higher scores by means of the study. We also assume that the one-time intervention TogetherReflect offers might be too short to have a measurable effect on eudaimonic elements (e.g. empathy trait questions). To determine potential long-term effects, a long-term study or repeated measurements should be conducted.

Nevertheless, taking our qualitative data into account, TogetherReflect was able to evoke various levels of reflection, in line with the framework of reflection by Fleck and Fitzpatrick's [31] outlining a spectrum of five consecutive levels (R0-R4). Some participants did not report to have reflected (thus only engaging in R0: Description), but even for some of those it was an engaging and fun experience that fostered interpersonal relationships. As shown in the theme *Reflection and Perspective-Taking*, some participants reached R1: Reflective Description, reflecting but reinforcing their existing perspectives, Others progressed to R2: Dialogic Reflection, discovering novel constructive approaches [31] for communication, including enhanced self-awareness [65]. For instance, they realised the subjectivity of understanding conflicts and the importance of emotional sharing, thus answering **(RQ2)**.

As discussed in theme *Celebrating Diverse Approaches*, they also increasingly appreciated their relationship, indicative of R2: Dialogic Reflection as well [10]. While TogetherReflect might have the potential to inform R3: Transformative Reflection, i.e. by strengthening the self-determination and self-confidence of users so that they would change their behaviour in conflict situations accordingly, this would need further studies to assess this long-term effect.

Moreover, our qualitative findings suggest that participants especially enjoyed being able to reflect for themselves in a non-judgmental space, providing the (head)-space to identify their personal needs. This not only enabled them to be more explicit when discussing their emotions with their partner in the next phase but also nudged them to approach conflicts from their own perspective, realising the subjective view on conflicts. With this in mind, TogetherReflect can support the practice of nonviolent communication in a playful manner [91]. Nonviolent communication begins with observing the conflict, represented in our study by considering separate components and triggers of conflicts through visualising them in stages or panels. Following this, users are encouraged to express their feelings, which they reported being able to do effectively through visualisation using TogetherReflect's diverse tool palette. The next step in nonviolent communication involves identifying and articulating personal needs, a process supported by the self-confidence users gained during the initial individual drawing phase. The last aspect, making clear requests, was less emphasised in our study. Overall, facets of learning and practising more effective and kind communication could be observed in our data.

Nonetheless, it is important to note that TogetherReflect is an experience prompting a reliving of strong, negative, emotions. Thereby, the medium of VR has been shown to support the elicitation of strong emotions [60], whose effects, due to a distraction-free virtual environment, are comparable to or sometimes even stronger than in reality [55, 103]. As with all applications and systems that engage deeply with people on a personal level, involving emotions and potential triggers, using this system bears risks. These can include negative affects lasting beyond the VR experience, for instance rumination [29] and outcomes of reflection that might lead participants to question the nature of the relationship and similar. Although participants in our study did not personally experience such negative effects, some briefly considered the ethical implications during the Discussion phase. Further, we want to point out that there is an ongoing discussion regarding the stress VR can induce, especially for first-time users. This includes challenges with

usability, such as using the controllers, as well as the mental load and potential emotional overwhelm that VR can provoke. These factors may add an extra layer of stress, in addition to the emotional strain of confronting complex negative feelings, as experienced in TogetherReflect.) It remains an open question how the design space of VR can be made safer in this regard without compromising user autonomy.

We also reflect on the feasibility of TogetherReflect in real-life settings. Current market trends show a growing demand for VR headsets [1], coupled with a rising interest in multi-user social VR setups designed to provide shared gaming experiences [67, 72]. These trends suggest that owning two headsets or more per household may become the norm in the near future. However, even without this projected shift, we envision TogetherReflect being seamlessly adaptable for asynchronous use. Existing multi-user VR experiences already use a similar setup as for TogetherReflect, namely microphones and real-time partner visualisation within VR. Although not tested in this study, we believe that TogetherReflect can easily support couples who are physically apart, enabling them to work effectively on their conflicts and relationships in long-distance relationships.

6.2 Design Recommendations

Based on our findings, we discuss design recommendations for designing multi-user VR-based interventions that aim to foster emotional self-expression and reflection for couples. We will discuss three specific design recommendations relevant for the HCI community.

6.2.1 Implications for Individual vs. Dyadic Use Cases. The voice-based guidance of TogetherReflect was designed to create a reassuring atmosphere, a 'framework of freedom' as Rubin [92] calls it. The prompts are aimed to stimulate reflection and providing encouragement, similar to approaches from art therapy [23]. Related work found that VR-based guidance can facilitate flow and reduce blank-page syndromes in complex open-ended tasks [108]. Thus, we assumed similar results in our study. In our study, we encountered that users mostly used the provided voice-based guidance at only two stages during the experience: at the beginning of each phase, and towards the end of each phase. Participants reported using it for task instructions and to overcome the fear of facing a blank page or canvas, the so-called 'blank-page syndrome' [92]. Towards the end, they used it to check if they forgot anything essential. They rarely used it to actively get support for reflection during the phases. Given that participants reported being immersed and in flow, it rather appears that the emotional expression and VR drawing facilitated flow, similar to other creative art approaches (e.g. [19]). Further, for solo users, voice-based guidance may be more essential, serving as a companion and source of encouragement throughout the experience [108]. In contrast, users were sharing the space with their partner in TogetherReflect, explaining own drawings and asking questions to each other in the Discussion phase. Thus, it appears that in the use case of dyadic conflict and emotion visualisation, the presence of a beloved one and human scaffolding might have overshadowed the need to use system-related guidance to be able to reflect. Based on these aspects, we recommend that VR experiences for couples should:

Recommendation 1—Provide strategic voice guidance at critical points and minimise voice-based guidance during multi-user experiences.

6.2.2 Accomodating a Spectrum of Relationship Goals. Our findings revealed that TogetherReflect was appreciated both as a eudaimonic experience for personal reflection and as a hedonic experience for shared quality time. Each aspect offered unique benefits, leading to working through the conflict and expressions of pride and appreciation for their partner, often conveyed through compliments. Participants also highlighted the enjoyment derived from the teamwork aspect of TogetherReflect, and valued the meaningful time it allowed them to spend with their partner. These aspects align with the principles outlined in the Seven Principles of a good relationship [33], thus emphasising how TogetherReflect contributes to strengthening relationships.

However, the diverse range of user needs underscores the importance of designing VR experiences with flexibility, allowing space for varying relationship goals. Thus, technology that supports emotional expression in couples could offer a spectrum of experiences, ranging from facilitating deep reflection to enabling playful and engaging interactions with a partner. This flexibility ensures that there is room for both individual growth and the development of the relationship as a whole. We found that TogetherReflect successfully achieved this goal by (i) creating immersive, distraction-free VR environments, offering couples the mental and physical space to reflect on their relationship and enjoy quality time together amidst daily life's demands; (ii) structuring the experience by first offering individual spaces before transitioning into a shared space within VR; and (iii) providing a diverse set of tools for emotional expression, accommodating a wide range of personalities and communication styles. Thus, we recommend that VR experiences for couples should:

Recommendation 2—Provide flexibility to accommodate a spectrum of relationship goals, being personally adjustable to both support individual reflection and shared experiences.

6.2.3 Incorporating Playful Elements for Serious Contexts. Our findings showed that participants enjoyed the simplicity and childlike form of visualising complex emotions. At the same time, they remarked that the options to express emotions offered by the tool palette were optimal for this task. These findings highlight that a playful approach, i.e. the basicness of drawing emotions, can be considered as a form of comic relief [43] when addressing serious, emotionally challenging topics such as emotions felt during a conflict with a partner. Importantly, TogetherReflect was neither intended nor designed as a serious game [2, 13], which typically aim to teach serious content through gamification (see section 3). Rather, its design focused on facilitating the expression of difficult emotions with negative valence in a reflective yet joyful way. In this regard, TogetherReflect aligns with findings from related fields. For instance, humourous and comic elements have been shown to affect players of computer games [43]. More relevant for this research are findings when using VR for emotion regulation purposes. Research in these areas also shows that incorporating

[1] https://medium.com/@annabell_37704/whos-really-using-vr-these-days-six-data-driven-insights-into-today-s-vr-user-demographic-422372a75c8c or https://academyofanimatedart.com/virtual-reality-statistics/

ludic elements alongside a clear, meaningful purpose is effective in addressing serious and emotionally challenging topics, such as managing low-valence emotions [106]. Apparently, this also holds true when considering multi-user setups for couples expressing and reflecting on their emotions during a conflict. While TogetherReflect has demonstrated to significantly reduce negative affect and increase positive affect, which are both indicators of emotion regulation [37, 66], future research could explore if TogetherReflect can be also classified as an emotion regulation intervention for both intra- and interpersonal contexts. We recommend that VR experiences for couples should:

Recommendation 3—Provide playful elements to balance serious contexts when couples are supported in expressing and reflecting on conflicts in a relationship.

6.3 Limitations & Future Work

In this section, we discuss the limitations of our work and explore opportunities for future HCI research when developing multi-user VR applications aiming to support couples in emotional expression.

TogetherReflect is a VR experience combining visual and verbal emotional expression. While this was a specific design choice to leverage the benefits of emotional expression (e.g. [49]) and multi-user collaboration (e.g. [97, 102]), we cannot isolate which specific aspect contributed to what extent to the observed effects. For instance, participants commented that the Individual Drawing phase greatly supported self-reflection. However, it remains unclear to what extent explaining and discussing their drawings influenced this perceived self-reflection as well. Future work could deduce the impact of those specific phases through varying these aspects. Furthermore, other methods and technologies may replicate some elements of TogetherReflect that contribute to conflict resolution, such as shared visual expression through pen and paper (e.g. [64]) or tablets [9]. However, it is unlikely that the overall experience – including the three phases that utilise VR-specific features such as exploring and walking through each other's drawings – could be effectively replicated by other 2D methods to achieve comparable results.

Additionally, participants were given the freedom to select their own conflict scenarios, which ranged from everyday disagreements, such as choosing the "correct" washing program, to more significant, once-in-a-lifetime conflicts, such as behaviours when having a baby. This introduced variability between pairs. While this flexibility allowed for a more authentic experience in TogetherReflect compared to recalling conflicts based on predefined themes, future studies could recruit participants with similar conflict backgrounds to better assess the effectiveness of systems such as TogetherReflect. Further, in our study, participants remembered their emotions in relation to an already resolved conflict with the partner. This approach was chosen out of ethical concerns while testing this prototype, such as to avoid rumination [29] and the potential risk of introducing additional stress or uncertainty in their relationship. The next logical step is to explore how TogetherReflect would function in the context of ongoing conflicts, particularly whether it could support active conflict management without inadvertently increasing emotional strain. While TogetherReflect demonstrates strong potential in this regard, we recommend initial testing alongside therapists as a precautionary measure. Moreover, TogetherReflect was specifically tailored to two people in romantic relationships. It would be valuable to investigate how these findings might extend to other contexts, either including more than two people or exploring how it could be used to explore conflicts with close friends or family members and how the interactions might change in those settings. To that end, a first approach investigated a similar approach for conflict management for teenager-teenager and teenager-parent pairs, with overall positive results [102].

7 Conclusion

This paper explored how multi-user VR, through *TogetherReflect*, can support a couples' emotional expression and shared understanding of a conflict they experienced in their relationship. We conducted a user study with $n = 20$ people to investigate how TogetherReflect aids emotional expression, communication, and reflection through an eclectic tool palette to create own virtual environment, discuss them, and collaboratively create drawings, while being guided by voice-based prompts encouraging reflection. Our findings show that TogetherReflect reduces negative affect, helps to disentangle the conflict and subsequent emotions, as well as aids in self-reflection and perspective-taking. Through the visualisation of differences in a playful manner, TogetherReflect fostered an appreciation for the relationship and provided the space for self-growth and engaging connections with the partner. We hope that our work, through specific design recommendations, informs future research supporting emotional expression and conflict management for people in romantic relationships.

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