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Through Troubled Waters: A Narrative Game for Anger Regulation

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Abstract. Emotion regulation, such as one's ability to attenuate the negative impacts of anger, is an important skill that requires recognizing related emotions and knowing appropriate responses. This work presents *Through Troubled Waters* (TTW), a narrative-based video game that allows people to explore and experiment with different anger coping mechanisms in a playful environment. We describe how the design of the game aims to support players in recognizing, labeling, and responding to emotions related to anger. A pilot study with 18 participants was conducted to assess important game mechanics such as dialogue choices and the collection of 'strategy cards'. Our findings show that participants were able to effectively communicate about the anger coping strategies that were presented in the game and potentially reflect on their own strategies. Additionally, more than half of the participants reported the desire to adjust their current anger coping styles. This suggests the potential use of TTW and this type of serious gaming as a supporting tool for emotional intelligence education and mental health interventions.

Keywords: Anger coping strategies · Video games · Emotion regulation · Anger regulation · Storytelling · Serious games

1 Introduction

Emotional intelligence plays a crucial role in many aspects of a person's life, such as at school or work and in their personal relationships [13, 16] - thus, it is a necessary aspect of functioning in society [15]. Emotional intelligence includes a range of knowledge and skills, such as the ability to understand, express and regulate emotion [42]. These skills are connected to each other. When expressing emotion, we are sending signals to others to communicate our emotional states, which can benefit us by receiving assistance [42]. The knowledge about how to

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cope with emotion is highly related to emotion regulation, which has been an important topic in the field of psychology for years [10,42]. Emotion regulation refers to the ability to monitor, evaluate and modify emotional reactions [43], and can help us maintain a more stable emotional state and achieve our goals in everyday life [6].

There is evidence that serious games are an effective tool in improving mental health [14,26] either as stand-alone interventions or as part of psychotherapy [12]. Previous research has used serious games and gamification in the field of emotion regulation (e.g., Pacella and López-Pérez's study on children's regulation strategy tendencies [32]). Storytelling in games has been used to enhance empathy and emotion understanding and showed promising results [40,41]. Similarly, card games have been used as a tool to understand emotional expression, recognize facial expressions, and learn to cope with emotions [20,27,49]. Additionally, games can be used for experience-based learning, which has several advantages. For example, games are frequently designed to be highly interactive and require players to apply what they have learned as part of their game experience. Experience-based learning using games is also often perceived as more fun and therefore motivates learners to be active participants [19]. Studies such as these reveal the potential of games to support the development of emotional intelligence.

The present study focuses on supporting players in better regulating their emotions - specifically *anger*. Anger is considered to be a commonly suppressed and sometimes unrecognized emotion despite being easily triggered [8,31,34]. The suppression of anger can amplify the emotional pain as well as the sensitivity to its experience [29,34]. A model of six anger coping strategies has been proposed [28], which includes *anger-out*: direct expression of anger in an aggressive manner; *diffusion*: deflection of anger to another stimulus or activity; *avoidance*: leaving a situation and suppressing the feeling of anger; *support seeking*: seeking support in others; *assertion*: expressing constructively the anger or solving the angering event and *rumination*: coping with anger by repeatedly deliberating over its cause.

For anger regulation, previous research explored and confirmed the efficacy of games in eliciting anger in research settings [46,47]. For example, when being unfairly treated in the *Ultimatum Game*, players were found to experience feelings of anger and to use different coping strategies to regulate their emotions during gameplay [46]. However, their study only focused on two broad categories of anger regulation instead of six specific anger regulation strategies [28]. Furthermore, by only asking players to retrospectively describe their coping strategies and subjectively applying a category label, inaccuracies and biases may have affected the results [5,21,48].

This study aims to address these limitations by **examining all six anger coping strategies (four of which are implemented in a pilot study) and asking players to consciously think about different ways of coping with anger as part of a game**. For this purpose we created *Through Troubled Waters* (TTW), a narrative-based video game that allows players to explore and

experiment with different anger coping mechanisms. It is an adaptation of the prototype of *When Life Gives You Lemons* (WLGYL), a video game designed in a separate study to support autistic girls in their socio-emotional development [27]. WLGYL addressed a broader range of target learning goals that were specific to its target audience, which was also involved in co-designing the game. Although emotional learning was already part of the game conceptually, the implementation was still incomplete with room for expansion and improvement. The present study kept a number of key features from WLGYL, but changed the content to only focus on emotional learning and coping strategies, as well as broadening the target audience.

Taking into account the effects of video games on learning [19,36], we anticipate that players will gain a better understanding of anger coping strategies after having played TTW. Furthermore, previous studies have suggested that games could trigger self-reflection in players [11,22,23] and potential behavior changes [4,17,22]. We therefore explore whether a game in which players choose to act according to anger coping strategies will cause reflection or even changes of their own anger regulation strategies in their own life. The central objectives of this study are to examine whether an anger coping game can get players to:

1. better understand different ways of anger regulation (direct goal of the game);
2. self-reflect and change their anger coping habits (indirect goal of the game).

2 Game Design

Providing the plethora of existing research tools in the intersection of serious gaming and mental health, we opted to use an already existing game as a starting point. This was done with the purpose of utilizing some earlier researched game features for emotional skills as a base to build on the more specific goals of anger regulation. We chose to adapt WLGYL as it addressed these relevant matters to our research (i.e., emotion) and the code was available to us for modification. Furthermore, it was expected that a narrative-based game would be a good choice to achieve positive effects in changing behaviors [50]. The game was developed in Unity [2] as game engine, using Yarn Spinner [3] to create dialogue and branching narratives. It was built for WebGL targets and deployed to Github Pages so it could be played in the supported internet browsers. In the game development, we adopted the applied games engagement model [25] which supported more intentional design decisions to ensure integration of the serious purpose (anger management) to the game systems. The decisions we made during the design process will be described below.

2.1 Original Game: *When Life Gives You Lemons* (WLGYL)

A number of features from WLGYL were kept, as they were conducive to the aims of our present study. For example, we used most of WLGYL’s assets, such as the world map and characters, as well as the pixel art and friendly (‘cute’)

design, because of its aesthetic appeal to players and reminiscent of games that players have enjoyed in the past [30,39]. TTW also retained WLGYL's island setting and story theme, since going to a summer camp and being introduced to new people is a commonly familiar concept that offers opportunities for new experiences and incidents triggering anger [38].

Furthermore, we decided to maintain that players make choices during gameplay. In WLGYL it was a key feature to give players a sense of autonomy [27], which was also important for TTW as it can increase players' immersion and enjoyment [37]. The original card collection feature, whereby players are rewarded with informative cards related to target skills during in-game scenarios, was modified to include (newly designed) cards specific to anger regulation. The aim was to reinforce learning about new anger coping strategies, directly mapping it to our research objective - under the assumption that cards would be an engaging way to introduce emotion regulation concepts. Players can learn more about their own anger coping habits by noticing which cards they have collected and used (see Fig. 1) with the goal of inducing self-reflection and behavior change upon potential new realizations.



Fig. 1. Unlocking a new card (left) and the card as shown in inventory (right).

2.2 Modified Game: *Through Troubled Waters* (TTW)

In the modified game¹, players decide on the ways that they want to cope with anger through making choices in anger-triggering events. We removed elements of the game that were not related to our research objectives, such as the player's stats and energy bar, phone interactions and the tasks list.

Regarding the game scenarios, we wrote a new story that focuses on several anger-triggering events that happen to the player character (PC). Players can engage in dialogue with non-player characters (NPCs) as in the original game, but their in-dialogue choices are specifically related to the PC's anger coping

¹ The Unity source code for the game can be found here https://osf.io/etxu7/?view_only=f8e01202eabf4fb4b22a9394603170a2.



Fig. 2. Dialogue during the second scenario of the game and choosing how to react to an anger triggering event.



Fig. 3. Player exploring the island.

behavior. See Fig. 2 for an example of the dialogues. Considering the limited scope of this game as an experimental exploration, four anger coping strategies were selected out of the total six strategies and are provided throughout the game for players to choose from. *Avoidance* and *anger-out* were chosen as the two extremes in the anger -in/-out spectrum. We further included *support seeking* as a frequently used strategy with high stability and *diffusion* as a novel factor in the anger responding model that is not close to either end of the spectrum [28].

When choosing, the players earn a card that corresponds to the selected anger coping strategy. This aims to fulfill the direct objective of this research: **players learn the name and description of an anger coping strategy and see an example of how the strategy may be used in a social setting.** Previously collected strategy cards can be used in subsequent dialogues to apply the strategies through the given choices. When not engaged in dialogue, the player can walk around the island to explore it, adding to the feeling of autonomy [37] (see Fig. 3). Once the player is ready to continue the story, they can enter a new scenario by talking to one of the NPCs.

3 Method

We conducted a pilot study to examine if we could find supporting evidence that our design choices in TTW would succeed in achieving the research objectives. The experiment process, the involved research instruments and the data analysis are described in the following sections.

3.1 Measurements

To measure participants' preference for anger coping strategies, we use the behavioral Anger Response Questionnaire (BARQ), a validated measure of the six anger coping strategies (see introduction). All six of the factors are covered by 6–7 items, which contribute to a total number of 37 items. The items describe how people could react when they feel angry and the choice is made on a 5-point frequency scale, from 1 (rarely) to 5 (very frequently).

In addition to the questionnaire, we also conducted interviews to investigate the participants' understanding and self-awareness of anger coping strategies. Interviews were semi-structured, allowing for open answers while keeping a consistent structure. The interview consisted of 8 questions covering three topics that are directly related to the research goals. The first section focused on the participant's emotion activation and relatability to the main character. Finding out about the experienced emotions and identification with the character was considered necessary in estimating the validity of the following questions. The second section was aimed to check the participant's recall and understanding of anger coping strategies within the game. Finally, the third section examined the participant's level of self-reflection on anger coping strategies as a result of their game experience and their will to make changes related to the strategies in the future.

3.2 Sampling and Experiment Procedure

Participants were chosen using convenience sampling, only including young adults and teenagers. No other inclusion criteria (e.g., presence of anger issues) were applied. The experiment procedure consisted of three stages. Before starting, participants were asked to provide their consent to the collection of data from the questionnaire and the audio recording of their interview. Participants were informed that all data would be stored anonymously in a safe location and used only for this research. In the first stage of the experiment, participants would fill in the BARQ questionnaire, which is referred to as the pre-game questionnaire in this paper. All questionnaires in this study were sent and filled out online through Qualtrics [1]. In the second stage, the participants would play the game, which was available online. There was no pre-defined duration of the game. The participants were asked to play until reaching the end of the game, which was clearly stated in the game through an 'ending' message. The third stage consisted of retaking the same BARQ questionnaire (i.e., the post-game questionnaire) and performing the interview. The whole experiment process was designed to last between 30–60 min.

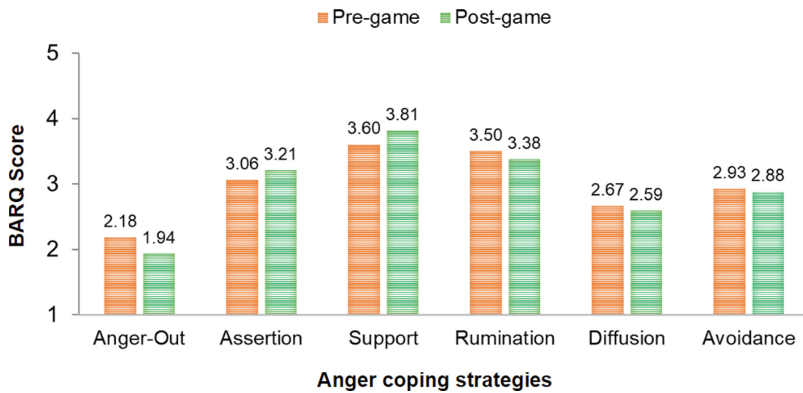


Fig. 4. The average BARQ score for each strategy (N = 18). Support = Support-Seeking.

3.3 Data Analysis

Concerning the BARQ results, items that belonged to the same coping strategy category were grouped and averaged. This was done for both the pre- and post-game questionnaire. A paired Samples T-Test was performed in order to examine the possible differences in the average scores for each strategy between the two questionnaires. For the interview analysis, brief notes were made during the interview procedure to highlight the key answers by the participants. These notes were revised and adjusted afterwards, with the help of interview recordings. Finally, the answers were categorized and quantified. For example, for the question “What anger coping strategies did you experience in the gameplay? Could you describe them?”, the answers were processed by counting the number of times that an anger coping strategy was recalled and described correctly. A correct answer did not have to match the wording exactly, but needed to express a similar meaning as the sample description provided in the game. Since this process can be subject to the evaluators’ judgment, two researchers processed each answer independently and when there was a difference in their judgment, the specific interview answer would be marked and discussed within the whole research team to reach an agreement. The insight that was obtained from the quantification process was then further studied in a qualitative way by looking back to the participants’ more detailed answers and the results obtained from the questionnaires.

4 Results

Eighteen people participated in this study, most of which were bachelor or master students. Eight of them were surveyed and interviewed face-to-face while ten of them were surveyed and interviewed via a videoconferencing tool. The actual play time of the participants until reaching the end of the game was 8–15 min.

Table 1. Descriptive statistics and t-test results for pre- and post-game BARQ scores (N=18).

Strategy	Time	Mean	SD	t	df	p	Cohen's d
Anger-out	Pre-game	2.18	0.73	3.16	17	0.01*	0.75
	Post-game	1.94	0.77				
Assertion	Pre-game	3.06	0.97	-1.47	17	0.16	-0.35
	Post-game	3.21	0.89				
Support seeking	Pre-game	3.60	0.43	-1.70	17	0.11	-0.40
	Post-game	3.81	0.50				
Rumination	Pre-game	3.50	0.82	1.12	17	0.28	0.27
	post-game	3.38	0.90				
Diffusion	Pre-game	2.67	1.00	0.77	17	0.45	0.18
	Post-game	2.59	1.04				
Avoidance	Pre-game	2.93	0.85	0.49	17	0.63	0.12
	Post-game	2.88	0.81				

* Significant at alpha of 0.05

4.1 Quantitative Results

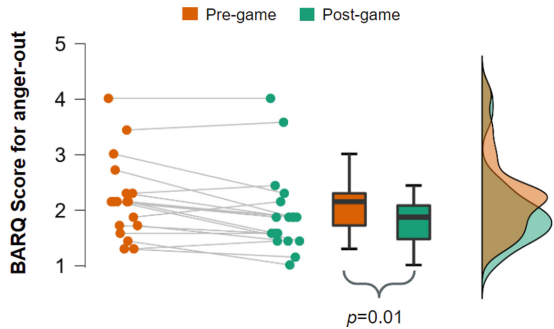


Fig. 5. A rain cloud plot of the anger-out scores before and after the game in 18 participants. The plot combines a cloud of points, box plot and a violin plot.

Figure 4 shows the average BARQ scores of each strategy in both the pre- and post-game questionnaires. When the participants completed this survey for the first time, support-seeking and rumination received the highest score (3.60 and 3.50, respectively), while anger-out was reported as the least frequently used strategy by participants (2.18).

After playing the game, the most and least frequently used strategies were still the same, although there were minor changes in their average scores, such as

the support-seeking score (from 3.60 to 3.81) and the anger-out score (from 2.18 to 1.94). See Table 1 for each strategy's mean and standard deviation results².

A paired sample t-test showed that there was a significant difference in participants' reported frequency of using anger-out strategy between the pre-game questionnaire ($M = 2.18$, $SD = 0.73$) and post-game questionnaire ($M = 1.94$, $SD = 0.77$); $t(17) = 3.16$, $p = 0.01$. Figure 5 shows a rain cloud plot of the changes in scores after playing the game.

4.2 Qualitative Results

Emotion Activation and Relatability to the Character: When being asked if they could describe what emotions the main character felt during the whole game, 88.9% of participants mentioned anger. They also reported emotions besides anger, such as happiness and excitement.

Answers about emotions that the participants themselves felt during game-play varied. 27.8% reported that they felt anger to some extent, such as (quoted verbatim): "Most of time I felt anger", "I thought the player is supposed to feel angry. I felt a bit angry but not so much because it felt not so real. I tried to feel like the character, especially in the last fight. I had a similar experience." Some of them reported neutral emotions or even relaxation or amusement: "I was pretty calm and relaxed cause I know it's a game."

44.4% of participants confirmed that they could relate to the main character (Q: "How does the character relate to you?"), answering e.g.: "Yes, even though the choices were quite limited compared to the questionnaire. I felt that I could easily get in the shoes of the character.", "We related a lot because they did everything I told them to.", "Yeah, I have been on summer camps. Shared experiences." However, there were 27.8% of participants having experienced no or low level of relatedness. One participant commented: "I wouldn't say we are the same at all. In those situations I would simply not care." "I don't feel identified with the character because it's a boy and not much background. I was from more of an observer perspective." 27.8% of participants had answers somewhere in the middle between "yes" and "no". Their replies showed that while they felt in control of the character, the choices provided by the game did not allow them to accurately represent their actual choice, reducing the amount they could relate. An example for such a reply is: "Not entirely. Some choices did reflect what I would do but it wasn't the exact reaction I would go for."

Understanding of the Strategies (Direct Goal): Participants generally indicated that emotion regulation was not a new topic to them. 88.9% of participants reported that they had heard theories about how to deal with emotions like anger before playing this game. When asked about which anger coping strategies they had experienced in the game play, all of them mentioned the avoidance strategy, and 94.4% of participants experienced support-seeking in their game

² More detailed results can be found here https://osf.io/etxu7/?view_only=f8e01202eabf4fb4b22a9394603170a2.

journey. Anger-out and Diffusion were also mentioned by some participants (50% and 38.9%, respectively). When mentioning the strategies, the participants could describe the strategies in their own words and understand how a strategy works. As an example, one answer was: “First, seeking help: finding someone that I am comfortable to talk with and open up. Second, focus on working: playing dodge ball-ignoring the situation and trying to forget it...” Some participants also mentioned that they would like to choose some other strategies, rather than the ones provided as options in the game. For example: “For the last one I think there should have been more options, (such as) approaching people in a normal manner.” “I would have probably found the middle ground between the answers.”

Self-reflection and Change (Indirect Goal): When asked which anger coping strategies the participants used in real life, 72.2% mentioned avoidance and 66.7% mentioned support seeking. While participants were not new to the presented coping strategies, some were not aware that reactions were actually a recognized strategy. One participant said: “I haven’t framed them so much as strategies. For myself I haven’t seen seek for help as a technical strategy for my anger. It’s more unconscious.”

27.8% of participants indicated that they would likely not apply any of the game’s coping strategies to their real life, e.g. because “the system I have in place is working just fine and is serving me well.” 55.6% of participants suggested they might try some strategy that they did not use often in the past or make some changes to the way they reacted to the angering event. For example: “Maybe I would try to be more active when coping with anger... maybe talking about it more, or confront the person... something I would like to try in my life.” 27.8% of participants stated that this game gave them a chance to reflect on their own anger-coping strategies: “I think most of them are something that I usually do in my life. I didn’t feel anything new. But the game helped me to organize my strategies. In the first survey I didn’t know that clear, but in the second survey I was more clear to think about my own strategies.” “I use a lot avoidance, so during the game I was questioning myself how good or bad it is.” “In the game I realized that avoidance can also be a behavior of oppression to yourself, and so that it can also have negative results.”

5 Discussion

To examine the effectiveness of this game in achieving the two research objectives (whether an anger coping game can get players to 1. better understand different ways of anger regulation; 2. self-reflect and change their anger coping habits), we first verified its efficacy in creating anger-triggering contexts in which anger regulation could be elicited. According to the interview results, when playing the game, most of the participants indeed recognized that the player character felt anger, the target emotion, in the game scenarios. This result confirmed the previous research findings [46, 47] of the effectiveness of games in providing such a

context where emotions could be triggered and perceived by players. It is worth mentioning that participants further identified other emotions besides anger, such as happiness or excitement, since the PC was starting a new journey and making new friends. This suggests that the perception of in-game emotions is similar to the emotion perception in real life contexts, where individuals often feel more than a single emotion at the same time [9] and different individuals might have different reactions to the same event [45]. These findings indicate that there might potentially exist a good ecological validity in this study, especially if compared to strict experimental isolation, like removing all elements that are not directly related to anger provocation [33]. Higher ecological validity implies a better generalization of our experimental findings to the real world [24].

For the first research objective (direct game goal), from the interview results we can see that this anger-coping game, which successfully placed players in anger-triggering events, could help players to better understand different ways of responding to anger in related game scenarios. During the interview, participants were able to describe the strategies they used in the game and how those strategies worked, even for strategies that they hadn't recognized as an anger coping response before. In general, participants showed an understanding of different forms of anger responding and connected the styles that appeared in the game to their real life experience. While this, overall, indicates a positive result regarding our goal, it is worth exploring whether the interview itself also contributed to the process of learning in future research.

For the second research objective (indirect game goal), the majority of participants reported that the game helped them either reflect on their anger-coping behavior or develop a motivation to make changes to it. This result was expected based on related studies where a positive influence of games were found in promoting awareness and behavior change [4, 11, 17, 22, 23]. Based on pre- and post tests using the BARQ, we found evidence that the game affected the frequency with which participants would use different anger coping styles. One significant change was the reduction in using the anger-out strategy. This is possibly explained by results from the interview, which indicate that angering in-game situations made participants more aware that they disliked confronting people in such cases. Instead, they often preferred seeking support for their character and indicated that the game helped them feel more certain about this choice, possibly leading to the increased perceived usage of support-seeking in participants' real life (though this change was not statistically significant). Interestingly, a difference was observed in the BARQ scores of assertion and rumination, which were not provided as option strategies in the game. It is possible that the absence of the participants' preferred strategy in the provided options of a scenario triggered them to think about these two missing strategies. This finding further supports the effects of this game in triggering self-reflection and connecting in-game scenarios to real life experiences.

One additional insight is the players' relatedness to their game character. According to previous research, when players feel closely related to their character in the game, they could enjoy the game more, be more immersed [18, 44] and

be more motivated to play serious games [7,35]. From the interview results, we noticed different levels of relatedness to the character among our participants, which depended on the degree of similarity participants felt to their character and the degree of choice control (also mentioned in previous research [7]). Some participants found similarities in what the character was experiencing compared to their own past experiences. On the other hand, for participants who considered themselves as calmer or more mature, the game character's age was an issue - not allowing them to fully relate to a teenager character in a summer camp. This is consistent with previous findings on player identification (i.e., character appearance or personality traits could affect players' identification) [18,44]. Regarding choice control, one complaint was that the personally preferred coping strategy, or the ability to combine strategies, was not offered as an option in the game. This contributed to lowering the participant's sense of relatedness to the character's experience [7]. To improve relatedness, future development efforts could consider involving multiple character profiles for players to choose from, or provide more customization to better align the context of the PC with that of the player [44]. A bigger game experience consisting of more scenarios and all anger regulation strategies would allow the use of the cards multiple times, further improving the players' feeling of control [7,44]. To reinforce the reflection aspect, additional insight into their anger coping habits could be provided by showing which cards are used most frequently. Additionally, we only collected data from participants right after playing the game. In order to study long-term affects, multiple questionnaires and interviews should be taken over a longer period of time.

6 Conclusion

In this study, a video game has been adapted to focus on anger regulation and make players think about and choose their preferred anger response styles in specific anger-triggering scenarios. For the research objectives, (1) the interview results showed that this game can support players to better understand different anger coping styles, especially for the styles that were not recognized by the participants as strategies before (direct goal of the game); (2) both the questionnaire and interview results revealed some changes of participants' perception as well as preference of the usage of different anger coping strategies. After playing the game and experiencing anger responding scenarios, participants knew better about how they usually cope with angering events and what they want to change for better anger responses in their future life (indirect game goal). The finding that participants were able to recall and sufficiently explain a considerable amount of anger coping strategies featured in the game highlights the potential use of TTW as an educational tool for emotional intelligence. The triggered self-reflection and desire for behavior change that was observed on some participants further suggests the potential of this game as a powerful tool for mental health interventions such as therapy. Finally, provided that anger is just one of the various emotions, TTW and the insights from this study can be useful for research on other types of emotion regulation in the future.

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