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How to help your depressed friend? The effects of interactive health narratives on cognitive and transformative learning

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Using narratives is an important communication strategy in mental health campaigns to empower readers to adequately help people suffering from depression. These narratives could be enhanced by giving readers agency to make choices on behalf of the main character that noticeably affect the narrative. Yet, few studies have explored the effects of these choices. This study investigated the effects of agency in an interactive digital narrative (IDN) about depression on cognitive and transformative learning. In two experimental, between-subjects design studies, the learning outcomes of a traditional (without agency) and interactive version (with agency) of a narrative about depression were compared. The mediating roles of identification, transportation and intrinsic motivation were also considered. In experiment 1 ($N = 216$), no effects of agency on cognitive learning, intrinsic motivation, identification or transportation were found. After better embedding learning content and increasing the choices' meaningfulness in the narrative of experiment 2 ($N = 155$), agency positively affected transformative learning but not cognitive learning. The effect on transformative learning was mediated by identification with the character. These results suggest that agency in educational narratives about depression increases identification with caretakers and reflection on how to approach people with depression sensibly. Implications of these results are discussed.

KEYWORDS

interactive digital narratives, agency, cognitive learning, transformative learning, identification, transportation, intrinsic motivation, mental health intervention

Introduction

Depression is a mental illness that can be hard to comprehend and talk about. Research commissioned by the Dutch government showed that many young adults wish to talk about depressive feelings, but find it difficult to start a conversation themselves and often find little support from their environment (Rijksoverheid, 2021). It is proposed that the latter is in part due to a lack of understanding about depression, or "mental health literacy" (MHL; Jorm, 2000). People often are unaware of the signals that indicate depression, do not truly understand the thoughts and feelings that come with depression and can be uncertain how to approach the subject in conversation. As a result, an impasse

is maintained in which family and friends of those with depression feel ill-equipped to help, and thus, do not contribute to mitigating the mental health problems and improving the wellbeing of their loved ones. Given that a quarter of Dutch young adults suffers from mental problems (CBS, 2021) and that worldwide mental health problems are on the rise since the COVID-19 pandemic (Robinson et al., 2022), it is important to educate the public about depression.

Educational interventions that strive to empower the public to provide adequate help can aim to facilitate two types of learning: cognitive and transformative learning. Firstly, people may acquire relevant knowledge (e.g., “What are the symptoms?”), understand relevant concepts (e.g., “What is rumination?”) and apply knowledge about depression to real-life situations (e.g., “How to approach the subject in conversation?”) (Bloom et al., 1956). We coin this cognitive learning. Secondly, transformative learning occurs when someone reevaluates and adjusts their frame of reference as a result of an experience (Mezirow, 2003; Taylor and Cranton, 2013). Frames of reference refer to the values, feelings, and learned behaviors which define one’s worldview. One could argue that transformative learning resembles narrative persuasion (Green et al., 2019) as both involve a change in beliefs, intentions, actions, due to a (narrative) experience. By reassessing their frame of reference, friends and family can be made aware of their unique position to identify and address depressive symptoms in loved ones (Hess et al., 2014) and can be prompted to take action in a sensible way (Knaak et al., 2016). Cognitive and transformative learning are thus fundamentally distinct ways to alleviate mental health problems.

To attain these learning outcomes, Gray (2009) proposes that complex and sensitive information regarding mental health can best be communicated through narratives. A narrative can be described as “any cohesive or coherent story with an identifiable beginning, middle, and end, that provides information about scene, characters, and conflict; raises unanswered questions or unresolved conflict; and provides resolution” (Hinyard and Kreuter, 2007, p. 778). Narratives resemble our real-life experiences, in structure and content. Related to structure, both narratives and real-life experiences involve chronologically ordered causal actions and events, goals and obstacles on our way to these goals, and resulting emotions (Graesser et al., 1994). As for content, the covered topics and vocabulary in narratives match what we discuss in real-life and how we do this (Gardner, 2004; Mar and Oatley, 2008). This prior knowledge-based on our real-life experiences—makes it easier to generate inferences facilitating comprehension (Shapiro, 2004). Above this, narratives facilitate comprehension by inviting readers to “step into the shoes” of a character (similar to identification; Cohen, 2001). Readers make a deictic shift (Segal, 1995a,b) adopting the cognitive stance of the character and interpreting the narrative from

within. This shift enables mental transportation into the story world (Cohen et al., 2015, p. 240), which coincides with intense processing of the narrative (Green et al., 2019). A recent meta-analysis by Mar et al. (2021) found a robust effect of comprehension and recall of information being higher for narrative texts than expository texts, indicating that narratives can promote cognitive learning. As for transformative learning, the deictic shift allows readers to vicariously experience different perspectives (Segal, 1995a,b; Busselle and Bilandzic, 2008). Arguably, this prompts them to reevaluate their own frame of reference, which stimulates transformative learning (Mezirow, 2003).

Cognitive and transformative learning through narrative-based educational interventions can be enhanced by actively involving readers in the learning process, in line with the educational construct of active learning (Bonwell and Eison, 1991; Hammond et al., 2007; Murray, 2017; Roth, 2019; Zhou et al., 2020). Interactive digital narratives (IDNs) (Murray, 2017; Smed et al., 2019, 2021; Winskell et al., 2019) can be used for active learning. Interactive narratives transform readers into interactors and provide them with the agency to exert influence on “salient aspects” (the plot, perspective, etc.) of a narrative (Roth and Koenitz, 2016, p. 31). In the current study, agency is conceptualized as the ability to make choices on behalf of characters that have a meaningful effect on the narrative.

Agency in narratives could elicit two processes that, in turn, may affect both cognitive and transformative learning: narrative engagement and intrinsic motivation. Narrative engagement overlaps with the earlier mentioned constructs of identification and transportation (Bilandzic and Busselle, 2017). When interactors can make decisions for characters that have a perceptible effect on the narrative, interactors may be more inclined to identify with the character (Segal, 1995a,b) and to actively adopt the goals of this character (Green and Jenkins, 2014), possibly enabling a higher mental transportation into the story world (Cohen et al., 2015, p. 240; Hand and Varan, 2008). As a result, interactors may process information that is relevant to the narrative more deeply (Busselle and Bilandzic, 2008) and may internalize the perspectives of characters even more than in a traditional narrative (Cohen, 2001, 2006; Hand and Varan, 2009), affecting cognitive and transformative learning, respectively. As for intrinsic motivation, the decisions that interactors can make for characters could make them feel competent, autonomous and related to the characters in the narrative, boosting intrinsic motivation (Ryan and Deci, 2009) to process learning materials (i.e., cognitive learning; Patall et al., 2008) and to understand different perspectives (i.e., transformative learning; Mezirow, 2003).

Where previous studies have explored the potential of individual choices to promote learning and relevant processes outside of the context of narratives, the educational effects of

choices on behalf of characters to influence the development and presentation of a narrative has received less attention.

Hence, the following research question has been formulated:

RQ: To what extent does agency in a narrative about depression affect cognitive and transformative learning, and to what extent are these effects mediated by identification, transportation, and intrinsic motivation?

In conclusion, this study will explore the effects of agency on learning in a narrative context. The findings will provide new theoretical insights into the learning capacity of interactive narratives with an educational goal. The study consists of two experiments and provides a broad approach by assessing both cognitive and transformative learning and by taking the role of the relevant processes of intrinsic motivation, identification and transportation into account. Furthermore, given that traditional narratives are a popular tool to address mental health literacy problems (Gray, 2009), this study possibly provides organizations insight into how to improve educational mental health interventions.

Agency in interactive narratives

Interactive narratives give agency to their audience, which converts readers into interactors. Creators of interactive narratives can incorporate agency in different ways in their interactive narratives (e.g., Ryan, 2011, 2015; Crawford, 2013; Kway and Mitchell, 2018). The overarching idea of agency is that interactors can “(...) intentionally influence salient aspects (e.g., the plot) of a narrative” (Roth and Koenitz, 2016, p. 31) in some shape or form. Roth and Koenitz (2016) distinguish three different factors which determine the degree to which interactors can exert influence over an interactive narrative: usability, autonomy and effectance. Usability refers to a user’s interaction with the hardware and software interface of a system (Shackel, 2009). Therefore, usability can be seen as a prerequisite for agency. The current study focuses on the remaining two dimensions as they pertain to the interaction with a narrative rather than the system surrounding it. As for autonomy, Roth and Koenitz (2016) argue that the more choices interactors can make, the more autonomy interactors have in an interactive narrative: “the concept of autonomy describes the freedom to choose from a large set of options without feeling ‘pushed’ in one direction.” Effectance is about user impact, the degree to which each choice influences the narrative. Effectance (Klimmt and Hartmann, 2006; Klimmt et al., 2007) can be subdivided into two categories: local and global effectance. Local effectance describes an instant effect on a specific section of the plot. Global effectance describes a delayed effect that can impact later parts of the plot which can have consequences for the overall structure and progression of a narrative (Roth and Koenitz, 2016).

Agency and learning

The agency in interactive narratives can affect both cognitive learning (Hammond et al., 2007; van Enschot et al., 2019; Zhou et al., 2020) and transformative learning (Murray, 2017; Roth, 2019). By facilitating agency in one shape or form, educational interactive narratives fall under the scope of active learning (Winskell et al., 2019). In active learning, students are actively engaged in the learning process and actively reflect on learning materials (Bonwell and Eison, 1991). Active learning is considered a favorable learning method in part due to its ability to promote student engagement (Prince, 2004) and intrinsic motivation (Ryan and Deci, 2009) to grasp the learning material. Meta-analyses have found that non-digital (Freeman et al., 2014) and digital (Shi et al., 2020) active learning formats in classroom contexts are indeed more beneficial for cognitive learning than more passive lecture-based formats. Active learning can also be instigated through interactive narratives (Hammond et al., 2007; Winskell et al., 2019) and may trigger both cognitive learning and transformative learning. When an interactor has the agency to, for example, make choices on behalf of a character, the interactor enacts instead of witnesses the perspective of characters in interactive narratives and experiences the story events directly instead of vicariously (Hand and Varan, 2008; Rigby and Ryan, 2016). As a result, an interactor may process the information in the narrative more deeply (Busselle and Bilandzic, 2008) and may be more invested in the hardships that characters face motivating the interactor to understand the character’s perspective toward these conflicts (Hand and Varan, 2009), triggering cognitive and transformative learning respectively. Our hypotheses are as follows:

H1: Narratives with agency lead to a higher level of cognitive learning than narratives without agency.

H2: Narratives with agency lead to a higher level of transformative learning than narratives without agency.

Given the pivotal role of narrative engagement (subdivided into identification and transportation) and intrinsic motivation for both cognitive and transformative learning in interactive narratives, the interplay between agency, narrative engagement, intrinsic motivation, and learning will now be explored in more detail.

Agency, narrative engagement and learning

Narrative engagement can be described as the degree to which one is cognitively and emotionally involved in the narrative rather than in one’s immediate environment (Busselle

and Bilandzic, 2008). By devoting all cognitive resources on understanding (learning) concepts relevant to a narrative, narrative engagement can be viewed as a concept similar to engagement as mentioned in the context of active learning (Prince, 2004). Identification and transportation are well-known constructs when talking about narrative engagement (Bilandzic and Busselle, 2017). Cohen (2001) defines identification as “an imaginative process through which an audience member assumes the identity, goals, and perspective of a character” (p. 261). When readers are cognitively and emotionally involved in the unfolding of narrative events, Green and Brock (2000) speak of transportation to the story world. Cohen et al. (2015) state that identification enables transportation: readers are “absorbed into the story through the position and role of the character with whom one identifies” (p. 240; Brown, 2015; Bilandzic and Busselle, 2017). This means that identification with a character can facilitate the transportation into a storyworld: by adopting the role of a character, readers may be more cognitively and emotionally involved in the narrative. Therefore, it can be assumed that a higher level of identification may lead to an increased level of transportation.

Narrative engagement can have a positive effect on both cognitive and transformative learning. Several processes that affect learning take place when readers/interactors are engaged with a narrative. Firstly, readers are more likely to be emotionally affected by the narrative. As a result, it is more probable that schemata about prior experiences with these emotions are activated than when readers are not engaged in the narrative. These emotional schemata can be used as cognitive support to store and comprehend learning concepts (Kneepkens and Zwaan, 1995; Rees et al., 2013). Secondly, as narratives enable readers to take on a character’s perspective by giving insight into the thoughts, beliefs, feelings and sensory perceptions of protagonists (Bruner, 1986; Herman, 2009; Sanford and Emmott, 2012), readers perceive, think and feel (i.e., “perfeel”) simultaneously when engaged in narratives (Bruner, 1986). These processes trigger different brain regions, which can consequently facilitate cognitive learning (Yarkoni et al., 2008). Thirdly, readers who identify with a character are more likely to feel empathy toward a character and will be more inclined to try and understand the views and attitudes of a character (De Graaf et al., 2012; Hoeken and Fiekkers, 2014). Perspective-taking (Jarvis, 2012) and empathy (Taylor and Cranton, 2013) are not only relevant for identification, but are also key factors in transformative learning. Taking on the perspective of a character can make readers feel empathy for the character which may reduce judgment and promote a shared understanding. This in turn may result in the reflection and adjustment of one’s own frame of reference ultimately facilitating transformative learning. Lastly, when readers are transported in narratives, all cognitive processes are focused on the comprehension of the narrative. As a result, readers process relevant learning content more intensely (Green and Brock,

2002) and are more open to different perspectives (Green et al., 2004), which can be beneficial for both cognitive learning and transformative learning.

The agency in interactive narratives may enhance narrative engagement, as has been pointed out by narratological scholars for identification (Hand and Varan, 2009; Green and Jenkins, 2014; Roth and Koenitz, 2016) and transportation (Hand and Varan, 2008; Murray, 2017). Firstly, in interactive narratives, readers become interactors who, in the current interactive narrative, actively adopt the goals of characters by making decisions for them. Moreover, interactors can better empathize with characters, because they experience the events that characters face directly instead of vicariously (Rigby and Ryan, 2016). Secondly, in interactive narratives, the unfolding of events is affected by choices of the interactor and as a result, interactors are invested in the outcomes of their choices and the course of the narrative as a whole (“the consequences of those events are felt more deeply”; Hand and Varan, 2008, p. 13), making them more transported. Empirical studies point toward a positive effect of agency on transportation (Hand and Varan, 2007; Jenkins, 2014; Walter et al., 2018; Vázquez-Herrero, 2021) and identification (Hand and Varan, 2007, 2008; Peng et al., 2010; Jenkins, 2014; Dillman Carpentier et al., 2015; Walter et al., 2018; Green and Jenkins, 2020).

All in all, the literature points at a positively mediating role of narrative engagement in the effect of the agency in interactive narratives on both cognitive and transformative learning. Our hypotheses are formulated as follows:

H3: Agency within narratives has an indirect positive effect on cognitive learning through identification and transportation.

H4: Agency within narratives has an indirect positive effect on transformative learning through identification and transportation.

Agency, intrinsic motivation and learning

The agency that interactors have in interactive narratives can also motivate them to actively process learning materials. Self-Determination Theory (SDT) and its Cognitive Evaluation Theory specifically (Ryan and Deci, 2000, 2017; Rigby and Ryan, 2016; Tyack and Mekler, 2020) posits that humans have innate needs for autonomy, competence and relatedness that need to be fulfilled to be optimally intrinsically motivated. Autonomy is defined as the degree to which people feel in control over their behavior. Competence is the degree to which people feel capable and personal growth, and relatedness is the degree to which people feel connected to others. All three needs can be satisfied by interactive narratives. Interacting with and feeling connected to characters can satisfy the need for relatedness (Sherrick et al., 2021). As for the need for autonomy, by

making choices that noticeably affect the narrative, interactors can feel more autonomous than when passively reading a traditional narrative (Katz and Assor, 2007). Furthermore, in interactive narratives, interactors can have the agency to make the right (or wrong) choices and observe the effectance of those choices allowing them to feel competent (Patall et al., 2008). All in all, interactive narratives seem to be perfectly suitable to motivate readers to learn and consequently influence different learning types since they potentially fulfill all three basic needs. The current study focuses on the needs for autonomy and competence as they are directly related to the agency factors autonomy and effectance and are theorized to trigger intrinsic motivation.

Intrinsic motivation is a process relevant to both cognitive and transformative learning. It can be described as “the inherent tendency to seek out novelty and challenges, to extend and exercise one’s capacities, to explore, and to learn,” supported by the satisfaction of the three above-mentioned needs (Ryan and Deci, 2000, p. 70). As for cognitive learning, when people are intrinsically motivated, they process information more deeply (Hidi, 2001), and can better remember (Patall et al., 2008) and understand (Patall et al., 2017) learning concepts. Arguably, intrinsic motivation is beneficial for transformative learning as well. The readiness to face challenges, explore and learn associated with intrinsic motivation paves the way for reassessing one’s own frame of reference and—with that—for transformative learning.

Based on the above, we hypothesize a positively mediating role of intrinsic motivation in the effect of the agency in interactive narratives on both cognitive and transformative learning. Our hypotheses are formulated as follows:

H5: Agency within narratives has an indirect positive effect on cognitive learning through intrinsic motivation.

H6: Agency within narratives has an indirect positive effect on transformative learning through intrinsic motivation.

We developed the interactive health narrative *Cloudy* to test our hypotheses in two experiments, focusing on cognitive learning (experiment 1) and on cognitive learning and transformative learning (experiment 2). Our conceptual model can be found in Figure 1. We expect that the agency in a narrative will lead to more identification with the main character (Hand and Varan, 2009; Green and Jenkins, 2014; Roth and Koenitz, 2016) and, through this, to more transportation into the story world (Brown, 2015; Cohen et al., 2015; Bilandzic and Busselle, 2017). Subsequently, we expect that this higher identification and transportation have a positive effect on both cognitive and transformative learning (Green and Brock, 2000; Green et al., 2004). Additionally, we presume that the agency in a narrative will yield a higher intrinsic motivation (Katz and Assor, 2007;

Patall et al., 2008; Rigby and Ryan, 2016; Sherrick et al., 2021) and, through that, higher cognitive and transformative learning outcomes (Ryan and Deci, 2000; Patall et al., 2008, 2017).

Method experiment 1

Design

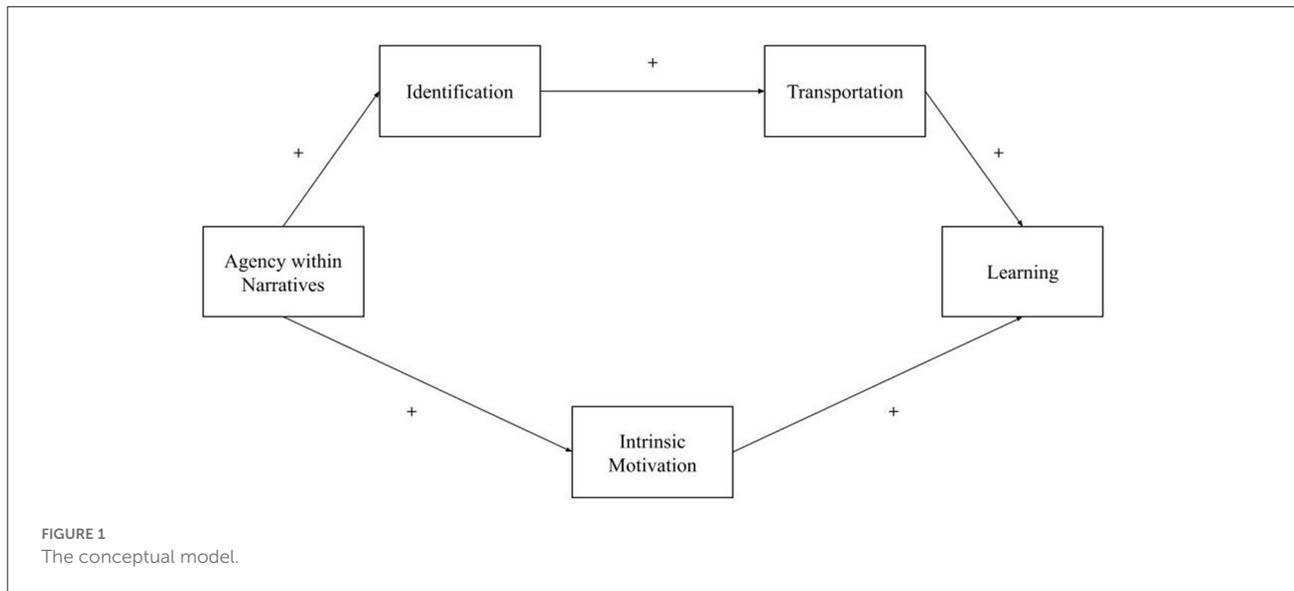
Experiment 1 adopted a between-subjects design to investigate whether agency in narratives about depression (IV: traditional vs. interactive narrative) positively affects cognitive learning outcomes regarding depression (DV), and whether this effect is mediated by intrinsic motivation on the one hand (MED 1) and identification and transportation on the other hand (MED 2 and 3). Participants were randomly assigned to the interactive narrative, traditional narrative or control condition.

Participants

Participants were acquired through the Human Subject Pool of the Tilburg School of Humanities and Digital Sciences and the personal network of the first author. Participants recruited through the Human Subject Pool received one credit of compensation for their participation. The desired age range for this study was 18–29 years old, as depressed people between 18 and 29 years old are most in need of conversation (Rijksoverheid, 2021) and people aged 18 to 25 in particular lack knowledge about recognizing and treating depression (Farrer et al., 2008; Reavley and Jorm, 2011). Both participants with and without experience with depression were included in the sample.

The total sample consisted of 277 Dutch participants. The data of 61 participants was not used in the analysis. These participants met at least one of the following criteria: (1) They did not complete the survey, (2) they did not comply with the age requirements, (3) they did not pass one of the attention checks (see “procedure”), (4) they spent more than 1 h on the survey or (5) they spent <5 min on the survey in the control group or <10 min in one of the narrative conditions.

The final sample of 216 participants after exclusion was well above the desired sample size. Based on a power analysis (G*power3, Faul et al., 2007), a sample size of 156 participants (52 per condition) was required to achieve a statistical power of 0.80 with a medium effect size ($d = 0.25$) and an alpha of 0.05. The participants were distributed across conditions as follows: 75 participants in the control condition, 68 in the traditional narrative condition and 73 in the interactive narrative condition. The participants’ age ranged from 18 to 29 ($M = 21.3$, $SD = 2.8$) and consisted of 152 females (70.4 %) and 64 males (29.6 %). Lastly, most participants were highly educated ($n = 204$, 94.4 %) and a majority had either experienced depression themselves



or had close relations with someone with depression ($n = 115$, 53.2 %).

Stimulus

For this study, an educational narrative was developed to teach young adults how to pick up on signals that indicate depression, how to initiate and navigate conversations about depression and to create awareness about the thoughts and feelings that are prevalent when suffering from depression. In this narrative, titled *Cloudy*, participants experience a day in the life of Sofie, who suffers from depression. The plot revolves around an unpleasant surprise visit by a friend called Mark. The story is told from the perspective of Sofie (intradiegetic, first-person point of view) and reveals her thoughts and feelings (i.e., internal focalization; Herman and Vervaeck, 2019; van Krieken and Sanders, 2021). *Cloudy* is text-based and written in Dutch and one storyline is ~2,300 words long.

The traditional and interactive version of *Cloudy* differ as follows. Throughout the interactive version of *Cloudy*, participants face five choices and can choose between two choice options at each choice. The consequences of these choices are minimal (i.e., the effectance is low) and always directly noticeable (i.e., local effectance). Agency in *Cloudy* is intentionally limited to maintain experimental control and to rule out content differences as a confounding factor. For example, at one point in the narrative, interactors can decide whether Sofie should open the door for Mark after he rings the doorbell for a surprise visit, yet after choosing to ignore the doorbell, Sofie hesitates and ends up opening the door anyway. The effect that this choice has on the narrative is only

directly noticeable and has relatively little effect on the narrative. After each choice, learning materials about a different subtopic about depression are presented, in an identical manner for both narrative branches. Moreover, the interactive narrative uses a foldback structure in which narrative branches intersect before each next choice and in which the ending is always the same. In the traditional narrative, choices are removed and the outcome of one of two choice options unfolds. A visualization of the narrative structure is available as Supplementary material and the whole traditional and interactive narrative (in Dutch) are available on OSF.

In this version of *Cloudy*, learning materials are communicated in two ways. First, the readers/interactors experience and learn about depression from the viewpoint of the protagonist Sofie. For example, in a conversation with Mark, thoughts of Sofie help readers/interactors determine whether conversational choices made by Mark help Sofie feel better or not. Secondly, the narrative is interspersed with separate expository text blocks which provide psychological explanations for occurrences in the story. These expository texts help readers/interactors understand why thoughts occur and provide information about depression that cannot be subtly molded in narrative form (e.g., statistics, facts). As learning materials are ideally intertwined in the narrative (Wolfe and Woodwyk, 2010), expository passages always came after narrative passages and oftentimes referred to narrative events to integrate the two types of texts. According to Beishuizen et al. (2003), this is an advisable strategy: readers are best able to use narrative content to understand learning materials if the main idea (i.e., learning concept) is presented after the example (i.e., narrative content). An example of a reference to the narrative in an expository text is: “In situation x, Mark could have helped Sofie by saying (...), because (...).” Expository texts were presented in italic

font so participants could easily distinguish the expository and narrative texts.

Learning materials covered several subtopics about depression and were developed through a variety of sources. First, interviews were conducted with a clinical psychologist and a young adult who was suffering from depression. Moreover, several academic and non-academic sources were assessed (the reference list can be found on OSF). Learning materials were divided into the following subtopics: (1) depression and negative thinking, (2) recognizing depression, (3) depression and social anxiety, (4) helping someone with depression and (5) seeking professional help. The learning materials consisted of factual knowledge (e.g., “Cortisol is a stress hormone that plays an important role in the symptoms of depression”) and instructional knowledge (e.g., “Be cautious about giving advice. People with depression often already know what is best for them.”).

Procedure

Due to COVID-19 restrictions, a Qualtrics survey was distributed to participants via the internet. After providing informed consent, participants were informed that they could not go back within the test environment. Participants were divided over the three conditions. In the control condition, participants answered only questions that measured cognitive learning outcomes. Participants in the narrative conditions were told that they were going to experience a narrative about depression, that they could encounter this narrative on popular news sites and were asked to experience the narrative at their own pace. After having seen the traditional or interactive narrative, participants were asked three attention-check questions (e.g., “Why did Sofie go outside?”). Participants then filled in, in respective order, the cognitive learning, transportation, identification and intrinsic motivation scales. Then, perceived agency was measured as a manipulation check with one item from Roth and Koenitz (2016): “I felt like I could make choices that affected the course of the story.” Finally, all participants were asked about prior experience with depression, demographics and were debriefed about the goal of the study. The final experiment took ~10–30 min.

Measures

Cognitive learning

Bloom’s taxonomy (Bloom et al., 1956) was used to establish the cognitive learning measure. Specifically, the levels “knowledge,” “comprehension” and “application” were used. The final scale assessed the aforementioned subtopics (e.g., depression and negative thinking) and consisted of twelve items with four items per educational level. This resulted in

a cognitive learning score which represents the number of correct answers out of twelve, four per level. Questions referred to the expository information and were multiple-choice with four possible answers and one correct answer. An example of a knowledge question is: “Which of the following symptoms is indicative of depression?”. An example of a comprehension question is: “What is a typical example of a rumination thought?”. An example of an application question is: “If a friend of yours would show symptoms of depression, how could you best approach this situation?”. The validity and difficulty level of this measure was assessed by assessment experts and explored in a pretest (see “pretest”).

Intrinsic motivation

To measure the mediating variable intrinsic motivation, the Intrinsic Motivation Inventory (IMI) was adapted for this study (Deci and Ryan, 1982). Only the subscale for interest/enjoyment was used as this subscale is considered to measure intrinsic motivation alone and by itself (Deci and Ryan, 1982). Four of the seven items in this subscale were used. Two items had similar counterparts and were not used to decrease the length of the survey. One item overlapped with the scale for transportation and was also omitted. Participants indicated to what extent they agreed with statements on a scale from 1 (“Not at all true”) to 7 (“Very true”). An example of a statement is “I enjoyed this way of learning very much.” Reliability of the scale was sufficient, $\alpha = 0.711$.

Identification and transportation

To measure the mediating variables identification and transportation, scales by De Graaf et al. (2012) were adapted for this study with ten items for identification and ten for transportation. Four items in the identification subscale had similar counterparts and were not used to decrease the length of the survey. In the transportation subscale, two items were not used for the same reason. Participants indicated to what extent they agreed with statements on a scale from 1 (“Completely disagree”) to 7 (“Completely agree”). An example of a statement for identification is “During the story, I felt like Sofie was feeling” and for transportation “During the story I forgot the world around me.” Four identification and four transportation items were rephrased in the opposite direction. Reliability for both identification ($\alpha = 0.813$) and transportation was sufficient ($\alpha = 0.785$).

Perceived autonomy

To measure whether participants indeed felt more agency whilst experiencing the interactive vs. the traditional narrative, perceived autonomy was assessed. One item was adopted from the autonomy scale by Roth (2015) tailored for the context of

interactive narratives, which is directly based on the autonomy factor of the Self-Determination Theory: “During the story, I felt like I was able to make choices that could influence the development of the story.” The item was measured on a 7-point Likert scale ranging from 1 (“Completely disagree”) to 7 (“Completely agree”).

The whole survey (in Dutch) can be found on OSF.

Pretest

Learning materials and questions were assessed for validity by a psychologist and an educational sciences expert. The educational sciences expert assessed whether the items of this scale correctly measured concepts of depression on the intended learning levels. The clinical psychologist assessed whether the information about depression was correct and whether the questions had a clear, single correct answer. By adjusting the information and questions based on the feedback of these professionals, expert validity was established.

To assess whether the measures and the narratives were easily comprehensible and were sufficiently difficult, four interviews were conducted before the main experiment. Participants were asked to fill out the preliminary survey and to place comments when they did not understand a question or part of the narrative. Learning scores were computed and comments were discussed after completing the questionnaire. Overall, the narrative was considered easily understandable and enjoyable. Based on the feedback, the narrative was slightly adjusted to improve comprehensibility and readability. The learning questions were relatively difficult, as participants had an average score of six correct answers out of twelve questions. The questions were not viewed as unfair, irrelevant or overly complicated. Based on these scores, a ceiling effect seemed improbable.

Data analysis

The data were analyzed using the program SPSS (version 27). First, scales were tested for reliability (Cronbach's alpha). Then, an independent sample *t*-test was conducted to assess whether the manipulation was successful, comparing the perceived autonomy for the interactive condition with the traditional condition. A one-way ANOVA with planned contrasts was used to compare the learning scores for the control condition vs. the two narrative conditions. To test the hypotheses, a mediation analysis was conducted using Hayes' (2022) PROCESS macro with the experimental condition agency entered as independent variable, cognitive learning as dependent variable, (1) identification and transportation and (2) intrinsic motivation as separate (serial) mediators.

TABLE 1 B matrix specifying whether (1) or not (0) antecedent variables have an effect on consequent variables.

	X	M1	M2	M3
M1	1	0	0	0
M2	0	1	0	0
M3	1	0	0	0
Y	1	1	1	1

X, Agency; M1, Identification; M2, Transportation; M3, Intrinsic Motivation, and Y, Cognitive Learning.

As the conceptual model (see Figure 1) is not among Hayes' (2022) preprogrammed models, a custom model was made using the B matrix in Table 1 (Hayes, 2022, Appendix B). This matrix specifies which antecedent variables affect which consequent variables (B matrix). The mediation analyses used 95% bias-corrected bootstrap CIs based on 5,000 resamples.

Results experiment 1

Manipulation check

First, an independent-samples *t*-test was performed to test whether the manipulation was successful. The homogeneity of variance was met, since Levene's test was not significant ($p = 0.316$). On average, people who read the traditional narrative ($M = 2.9$, $SD = 1.6$) scored lower on perceived autonomy than people who read the interactive narrative ($M = 5.0$, $SD = 1.7$). This difference was significant, $t(139) = -7.75$, $p < 0.001$, $d = -1.31$. It can be concluded that participants who experienced the interactive narrative felt like they had more autonomy compared to the participants in the traditional narrative.

Cognitive learning: Control group vs. narrative conditions

A one-way ANOVA with planned contrasts was performed to compare the learning outcomes of the three conditions (control, traditional narrative, interactive narrative). The homogeneity of variance was met, since Levene's test was not significant ($p = 0.213$). The ANOVA showed a significant effect of agency on cognitive learning [$F(2, 213) = 44.19$, $p < 0.001$, $\eta^2 = 0.29$]. The planned contrasts showed that the learning outcomes of the control group ($M = 6.6$, $SD = 2.0$) were significantly lower than of the traditional ($M = 9.2$, $SD = 1.7$) and interactive narrative ($M = 9.0$, $SD = 1.9$), $t(213) = 9.40$, $p < 0.001$, $d = 2.69$.

Overall results

Table 3 shows the overall results of cognitive learning (divided by knowledge, comprehension, and application), identification, transportation, intrinsic motivation and perceived autonomy for the traditional and interactive narrative conditions. Independent-samples *t*-tests were performed to compare the scores of the traditional and interactive group. The homogeneity of variance was met, since all Levene's tests were not significant (p 's > 0.05).

None of the differences were significant except for the difference in perceived autonomy. As mentioned in section Manipulation check, perceived autonomy was higher for the interactive narrative ($M = 5.0$, $SD = 1.7$) than for the traditional narrative ($M = 2.9$, $SD = 1.6$), $t(139) = -7.75$, $p < 0.001$, $d = -1.31$.

Effects on cognitive learning

A PROCESS mediation analysis (Hayes, 2022) was performed to test Hypotheses 1, 3 and 5 (see Figure 2, with an overview of all effects). The analysis indicated that there was no significant total effect of agency on cognitive learning, $b = -0.15$, $SE = 0.31$, BCa 95% CI [-0.75, 0.45], leading to the rejection of H1. In addition, there was no significant direct effect of agency on cognitive learning, $b = -0.19$, $SE = 0.30$, BCa 95% CI [-0.79, 0.41]. There was no indirect effect of agency on cognitive learning through identification and transportation, $b = 0.004$, $SE = 0.02$, BCa 95% CI [-0.03, 0.05], despite a positive direct effect of identification on transportation, $b = 0.35$, $SE = 0.06$, BCa 95% CI [0.23, 0.47]. This led to the rejection of H3. Furthermore, there was no indirect effect of agency on cognitive learning through intrinsic motivation, $b = 0.01$, $SE = 0.05$, BCa 95% CI [-0.10, 0.11], leading to the rejection of H5. In summary, it can be concluded that the data do not support H1, H3, and H5.

Exploratory analyses

To explore whether cognitive learning differed for people who had ($n = 79$) or had no ($n = 61$) prior experience with depression and whether this experience influenced the effect of agency on cognitive learning, a two-way ANOVA was performed with cognitive learning as dependent variable. On average, participants with prior experience ($M = 2.6$, $SD = 1.8$) had a higher difference score for cognitive learning than participants without prior experience ($M = 2.5$, $SD = 1.8$). The ANOVA did not show a significant main effect of experience with depression, $F(1, 136) = 0.07$, $p = 0.80$. There was also no significant interaction effect, $F(1, 136) = 0.76$, $p = 0.38$. The results indicate that people who had prior experience with depression

did not learn significantly more or less from the narratives than people who had no prior experience with depression and that experience with depression did not impact the effect of agency on cognitive learning.

Discussion experiment 1

Experiment 1 attempted to provide insights into the cognitive learning effects of agency in educational narratives. Learning outcomes of an interactive and traditional version of an educational narrative about depression were compared. Furthermore, the mediating roles of intrinsic motivation, identification and transportation were investigated. The analyses suggest that agency did not affect cognitive learning. Moreover, no mediation effects were found. These findings are not in line with previous studies pointing toward a positive effect of agency in interactive narratives on intrinsic motivation (Katz and Assor, 2007; Patall et al., 2008), identification (Hand and Varan, 2007, 2008; Peng et al., 2010; Jenkins, 2014; Dillman Carpentier et al., 2015; Walter et al., 2018; Green and Jenkins, 2020), transportation (Hand and Varan, 2007; Jenkins, 2014; Walter et al., 2018; Vázquez-Herrero, 2021) and cognitive learning (Hammond et al., 2007; Freeman et al., 2014; Shi et al., 2020). The insignificant results concerning cognitive learning in experiment 1 may well be explained by shortcomings in the stimulus design.

Firstly, the learning material was not fully integrated into the narrative. It consisted of separate narrative and expository segments, the latter containing the educational information. The expository segments were also presented in italic font, making them easily identifiable. The expository segments did refer back to the narrative but in a limited way and the expository segments were also not needed to grasp the story's progress. This could have resulted in the participants focusing primarily on plot comprehension rather than comprehension of the educational content, which might explain the lack of effect (Fisch, 2000).

Secondly, the relevance of the learning material for the choices represents another point of improvement. According to active learning theory, activities should be built around learning outcomes (Wiggins and McTighe, 2005). However, the educational content in the interactive narrative did not relate to the choices in the interactive narrative. For example, when participants were able to decide whether Sofie should open the door for Mark, participants did not need to rely on their knowledge of depression to make this choice. Cognitive load theory (Sweller, 2016) posits that our working memory is limited and that learning-irrelevant processing (i.e., extraneous cognitive load) can get in the way of learning-relevant processing (i.e., intrinsic cognitive load). This applies here; the choices are unrelated to the educational information and may have hindered learning by consuming working memory capacity (Schneider et al., 2018).

TABLE 2 Overview of descriptives, *t*-values and effect sizes per condition for experiment 1.

	Traditional narrative (<i>n</i> = 68) <i>M</i> (<i>SD</i>)	Interactive narrative (<i>n</i> = 73) <i>M</i> (<i>SD</i>)	<i>t</i> -value	<i>d</i>
Cognitive learning	9.2 (1.7)	9.0 (1.9)	0.49	0.08
Knowledge	3.4 (0.7)	3.4 (0.8)	0.10	0.08
Comprehension	3.0 (0.9)	3.1 (1.0)	0.16	−0.03
Application	2.8 (1.0)	2.6 (1.0)	0.96	0.16
Identification	4.6 (1.0)	4.8 (1.0)	1.10	−0.19
Transportation	5.3 (0.8)	5.6 (0.8)	0.65	−0.11
Intrinsic motivation	5.3 (1.0)	5.4 (0.9)	0.25	−0.04
Perceived autonomy	2.9 (1.6)	5.0 (1.7)	−7.75*	−1.31

**p* < 0.001 | *df* = 139.TABLE 3 Overview of descriptives, *t*-values, *df*'s and effect sizes per condition for experiment 2.

	Traditional narrative (<i>n</i> = 52) <i>M</i> (<i>SD</i>)	Interactive narrative (<i>n</i> = 50) <i>M</i> (<i>SD</i>)	<i>t</i> -value	<i>df</i>	<i>d</i>
Cognitive learning	10.4 (1.9)	10.1 (1.6)	0.70	100	0.14
Knowledge	3.3 (0.9)	3.3 (0.7)	0.28	100	0.06
Comprehension	3.3 (0.9)	3.1 (1.0)	0.81	100	0.16
Application	3.7 (0.6)	3.7 (0.6)	0.45	100	0.09
Transformative learning	2.9 (1.0)	3.2 (0.7)	−2.21*	100	−0.44
Identification	3.6 (0.8)	3.9 (0.7)	−2.09*	100	−0.41
Transportation	3.6 (0.6)	3.8 (0.6)	−2.28*	100	−0.45
Intrinsic motivation	3.8 (0.7)	4.0 (0.8)	−1.54	100	−0.31
Perceived autonomy	2.4 (1.3)	4.3 (0.7)	−9.99**	80.47	−1.85
Perceived effectance	2.3 (1.3)	4.2 (0.9)	−9.58**	90.77	−1.78

p* < 0.05, *p* < 0.001.

Thirdly, the limited effectance of the choices made by interactors is another shortcoming of the original stimulus. For example, when interactors choose not to open a door, Sofie proceeds to open it anyway. This can be categorized as a false choice or foldback structure where all options result in the same consequence (Mawhorter et al., 2014; Carstensdottir et al., 2019). This low effectance might have led to the rejection of H3, stating that agency within narratives leads to increased cognitive learning through a higher level of intrinsic motivation. The lack of effectance might have caused a lower intrinsic motivation through a decreased sense of competence (Roth and Koenitz, 2016) which could, in turn, have decreased the learning effect.

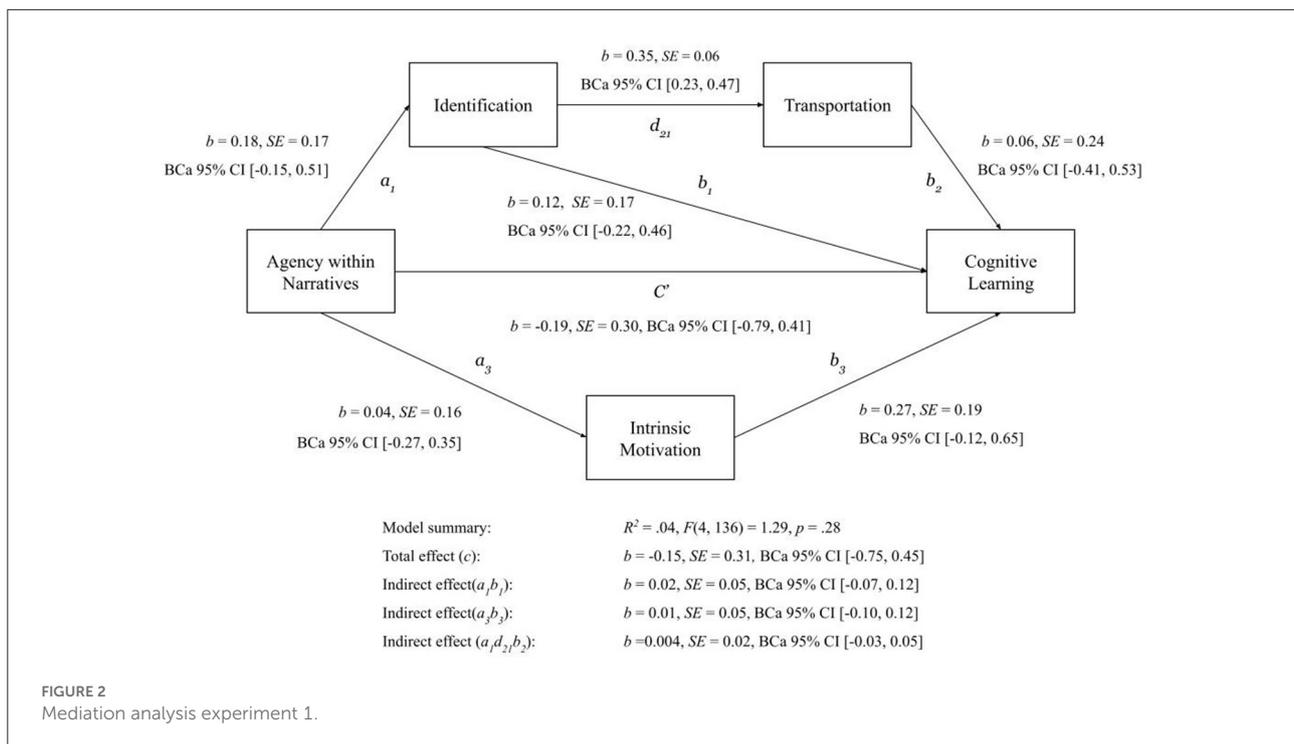
The triviality of choice might also explain why no support has been found for H3, that identification and transportation mediate a relationship between agency and cognitive learning. It could be that choices in the interactive condition were too insignificant to prompt participants to actively adopt the cognitive stance of the main character because the choices did not allow participants to meaningfully affect the character's life. Moreover, it was argued that participants would more likely be

transported into a narrative where the plot was tailored to the choices that they made. Yet, because choices had little effect on the plot, the low effectance of choices provide a reasonable explanation why agency did not lead to higher transportation. Hence, the triviality of choice provides plausible explanations why the results of the current study are not in line with previous research that found positive effects of agency on identification and transportation.

On the basis of the aforementioned discussion, adjustments were made for experiment 2.

Method experiment 2

For experiment 2, a new version of the interactive health narrative was created which improves on the potential shortcomings, i.e., the integration of learning materials, choice relevance, and choice effectance. Furthermore, transformative learning was included as an additional outcome variable.



Participants

Participants were recruited through convenience sampling of the researcher's personal network as well as the Human Subject Pool of the Tilburg School for Humanities and Digital Sciences and the survey exchange sites SurveyCircle and SurveySwap. According to a power analysis (G*power3, [Faul et al., 2007](#)), a statistical power of 0.8, with a medium-sized effect ($d = 0.25$) and an alpha of 0.05 requires a sample of 156 participants with 52 participants per condition. This sample size was almost achieved. The final sample consisted of 155 participants who were randomly assigned to the control ($n = 53$), traditional narrative ($n = 52$), and interactive narrative condition ($n = 50$). The participants' age ranged from 18 to 34 with the 18–24-year group consisting of 86 (55.5 %) participants and the 25–34-year group consisting of 69 (44.5 %) participants. Most participants were female ($n = 94, 60.7\%$), followed by male ($n = 60, 38.7\%$), and non-binary/third-gender ($n = 1, 0.65\%$). Most participants completed a bachelor's degree ($n = 81, 52.3\%$), followed by a high school diploma ($n = 34.84\%$), master's degree ($n = 17, 11.0\%$). Lastly, most participants had experience with depression themselves or experienced it up close ($n = 123, 79.6\%$).

From the initial sample of completed surveys ($N = 205$), 55 were excluded. Participants were excluded from the data based on the following criteria: (1) They did not

give consent, (2) they were outside of the age range, (3) they failed one or more of the attention checks, (4) they exceeded 1 h on the survey or (5) they took <3 min on the survey for the control group or <10 min for the narrative conditions.

Stimulus

In experiment 1, no significant difference was found concerning the cognitive learning outcomes between the traditional and interactive version of the narrative. Therefore, a new version of the narrative was created for experiment 2 which improves on potential shortcomings.

The original version of *Cloudy* was written from Sofie's perspective, a person struggling with depression. In the new version, the perspective was changed to that of Mark, Sofie's friend, who is trying to help her. One reason for this decision is that experiencing the narrative as a friend of a depressed person might be more relevant to the goal of the narrative to teach interactors how to handle conversations with people with depression. Furthermore, the narrative is being told from a second-person point of view ([Jahn, 2005](#)) instead of a first-person point of view, addressing the reader directly as if they were Mark (e.g., "You feel the urge to check in with Sofie and send her a message to ask what she's up to."). As in experiment 1, internal

focalization is used, providing access to Mark's thoughts and feelings.

Integration of learning materials

Resulting from the perspective change, the learning material in the new version of *Cloudy* focuses specifically on three main aspects when dealing with someone with depression: (1) detection of depression, (2) communication (addressing concerns, empathizing), (3) behavior (reacting to rejection, giving advice). Moreover, the learning material is not presented separately but is fully integrated into the narrative. In an effort to educate himself about depression, the main character gathers information at different points of the narrative (e.g., by consulting a mutual friend who is a clinical psychologist who specializes in depression). Therefore, the interactor is encountering the educational information together with the character.

Choice relevance

The new version of the IDN was adjusted so that the educational content is more relevant to the choices within the narrative. Each choice is based on learning material that the interactor encounters earlier in the narrative. Therefore, interactors can anticipate which option represents the right or wrong choice. For example, Mark reads that one should never disregard comments about suicide. Later, Sofie makes a suicide joke, after which the interactor has the choice to either ignore her remark or point it out. This is in contrast to the first version of *Cloudy* where the learning material was presented after making a choice and did not always directly relate to the choice.

Choice effectance

The choices within the new version were adjusted to have a narrative impact. Each choice an interactor makes has an immediate (local effectance) or delayed (global effectance) positive or negative consequence in the narrative and results in a different narrative branch. For example, after Sofie opens up about her depression, the interactor can choose how to respond. Depending on the choice, Sofie either reacts positively or negatively (local effectance). Furthermore, the interactor can reach four different possible endings. Firstly, they differ on the location the interactor chooses earlier in the story. Secondly, they differ on whether Sofie feels understood by Mark and agrees to seek professional help (positive ending) or does not feel understood and refuses to seek professional help (negative ending). This aspect depends on a previous choice where the interactor must decide how to address his concerns to Sofie (global effectance).

To make sure the same educational information is being encountered independent of the choices being made,

a partial foldback structure (Carstensdottir et al., 2019) was used to convene the narrative branches at different points (see the structure of the interactive narrative at the Supplementary material).

The adjusted traditional and interactive narrative (in English) can be found on OSF.

Procedure

The survey was exclusively distributed online due to the COVID-19 pandemic. The data collection was divided into two phases. In the first phase, participants were randomly assigned to the control or interactive condition. In the control condition, participants were asked cognitive learning questions regarding depression without being exposed to the narrative. In the second phase, participants were assigned to the traditional condition.

For the second phase, participants' choices and resulting story paths in the interactive condition were analyzed. The analysis showed that participants chose seven different paths. Each path within the sample resulted in the same (positive) ending. Most participants (75.66 %) solely chose the positive options. The other paths only differed by one choice, resulting in mostly identical narratives. Therefore, the traditional version of *Cloudy* was created based on the most chosen path. Apart from the stimulus, the procedure for the traditional narrative condition was the same as the interactive narrative one.

Measures

To ensure that the results are comparable, the same scales as in experiment 1 were used to measure identification ($\alpha = 0.82$), transportation ($\alpha = 0.69$) and intrinsic motivation ($\alpha = 0.76$). The identification scale by De Graaf et al. (2012) is especially suitable for experiment 2 as the subscales include perspective-taking and empathy, both of which are highly relevant for transformative learning.

The questions measuring cognitive learning (DV1) were created based on the learning material of the new version of *Cloudy*. Additionally, transformative learning (DV2, $\alpha = 0.69$) was assessed by means of the Learning Activities Survey (LAS) by King (2009). Four items were used and adapted (e.g., "While reading the story, I had an experience that caused me to question the way I normally act."). In addition to perceived autonomy, participants had to rate the level of perceived effectance (single item: "While reading the story, I felt like my choices had considerable impact on the events in the story.") to check how high participants perceived the impact of their choices to be in the new version of *Cloudy*. This item was adapted from the effectance scale by Roth (2015). All items were measured on a 5-point Likert scale (1 = "Strongly disagree", 5 = "Strongly agree").

The whole survey of experiment 2 (in English) can be found on OSF.

Data analysis

The same analyses were used as for experiment 1.

Results experiment 2

Manipulation checks

Two independent-samples *t*-tests were performed to test whether the manipulations of autonomy and effectance were successful. The first independent-samples *t*-test was used to compare the perceived autonomy of the interactive narrative with the perceived autonomy of the traditional narrative. The homogeneity of variance was not met, since Levene's test was significant ($p < 0.001$). On average, participants in the interactive condition ($M = 4.3$, $SD = 0.7$) scored higher on perceived autonomy than participants in the traditional condition ($M = 2.4$, $SD = 1.3$). This difference was significant, $t(80.47) = -9.46$, $p < 0.001$, $d = -1.85$. It can be concluded that participants who experienced the interactive narrative felt like they had more autonomy compared to the participants in the traditional narrative.

The second independent-samples *t*-test was used to compare the perceived effectance of the interactive narrative with the perceived effectance of the traditional narrative. The homogeneity of variance was not met, since Levene's test was significant ($p < 0.001$). On average, participants in the interactive condition ($M = 4.2$, $SD = 0.9$) scored higher on perceived effectance than participants in the traditional condition ($M = 2.3$, $SD = 1.3$). This difference was significant, $t(90.77) = -9.06$, $p < 0.001$, $d = -1.78$. It can be concluded that participants who experienced the interactive narrative felt like their choices had more impact on the events in the story compared to the participants in the traditional narrative.

Cognitive learning: Control group vs. narrative conditions

A one-way ANOVA with planned contrasts was performed to compare the learning outcomes of the three conditions (control, traditional narrative, interactive narrative). The homogeneity of variance was met, since Levene's test was not significant ($p = 0.565$). The ANOVA showed a significant effect of agency on cognitive learning [$F(2, 152) = 43.51$, $p < 0.001$, $\eta^2 = 0.36$]. The planned contrasts showed that the learning outcomes of the control group ($M = 7.3$, $SD = 2.0$) were significantly lower than of the traditional ($M = 10.4$, $SD = 1.9$)

and interactive narrative ($M = 10.1$, $SD = 1.6$), $t(152) = 9.30$, $p < 0.001$, $d = 3.15$.

Overall results

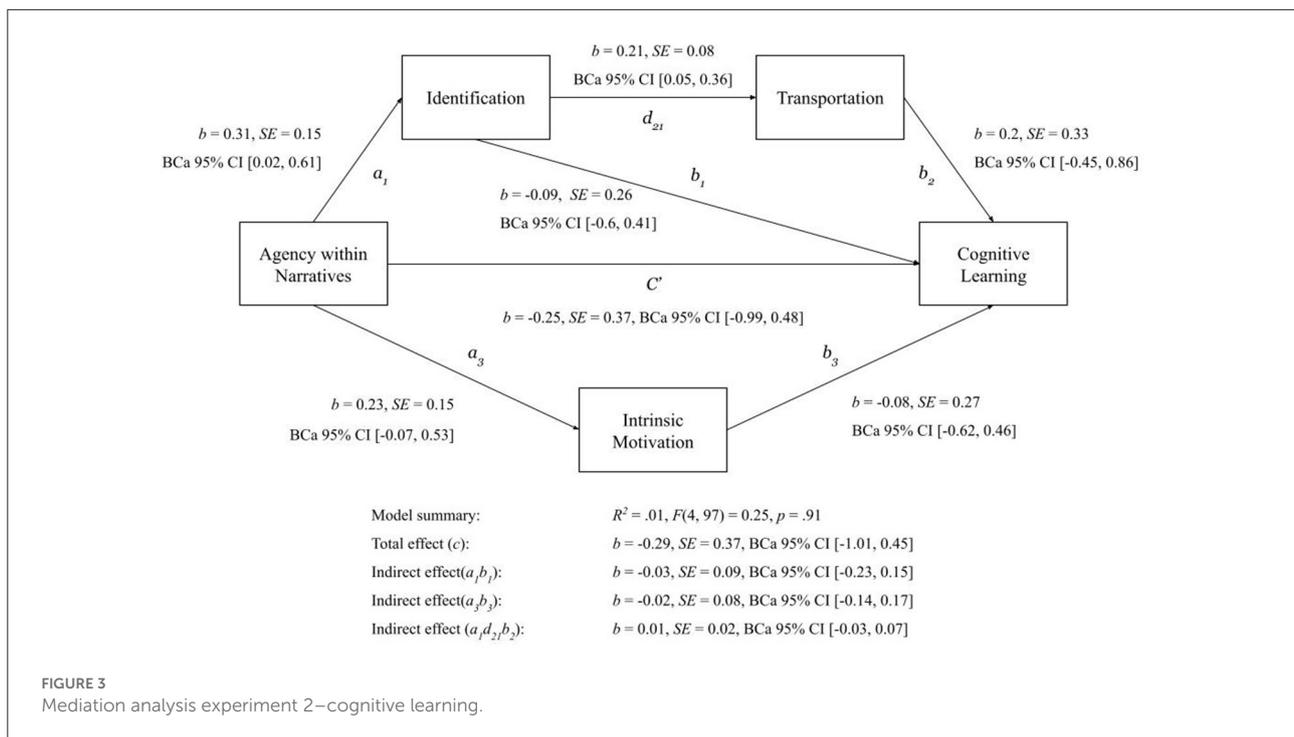
Table 2 shows the overall results of cognitive learning (divided by knowledge, comprehension, and application), transformative learning, identification, transportation, intrinsic motivation, perceived autonomy and perceived effectance for the traditional and interactive narrative conditions. Independent-samples *t*-tests were performed to compare the scores for the traditional and interactive narrative. The homogeneity of variance was met, since all Levene's tests were not significant (p 's > 0.05), except for perceived autonomy and perceived effectance.

As in experiment 1, none of the differences between the cognitive learning scores were significant. Transformative learning was significantly higher for the interactive narrative ($M = 3.2$) than for the traditional narrative ($M = 2.9$), $t(100) = -2.26$, $p = 0.030$, $d = -0.44$. Identification was significantly higher for the interactive narrative ($M = 3.9$) than for the traditional narrative ($M = 3.6$), $t(100) = -2.2$, $p = 0.030$, $d = -0.41$. Transportation was also significantly higher for the interactive narrative ($M = 3.8$) than for the traditional narrative ($M = 3.6$), $t(100) = -2.09$, $p = 0.040$, $d = -0.45$. The difference for intrinsic motivation was not significant but perceived autonomy and perceived effectance were significantly higher for the interactive narrative than for the traditional narrative (see section Manipulation checks).

Effects on cognitive learning

A PROCESS mediation analysis (Hayes, 2022) was performed to test hypotheses H1, H3, H5 (see Figure 3, with an overview of all effects). The analysis indicated that there is no significant total effect of agency on cognitive learning, $b = -0.29$, $SE = 0.37$, BCa 95% CI $[-1.01, 0.45]$ leading to the rejection of H1. In addition, there was no significant direct effect of agency on cognitive learning, $b = -0.25$, $SE = 0.37$, BCa 95% CI $[-0.99, 0.48]$.

There was no indirect effect of agency on cognitive learning through identification and transportation, $b = 0.01$, $SE = 0.02$, BCa 95% CI $[-0.03, 0.07]$, despite a positive direct effect of identification on transportation, $b = 0.21$, $SE = 0.08$, BCa 95% CI $[0.05, 0.36]$. This lack of indirect effect led to the rejection of H3. Furthermore, there was no indirect effect of agency on cognitive learning through intrinsic motivation, $b = -0.02$, $SE = 0.08$, BCa 95% CI $[-0.14, 0.18]$, leading to the rejection of H5. In summary, it can be concluded that the data do not support H1, H3, and H5, as in experiment 1.



Effects on transformative learning

A PROCESS mediation analysis (Hayes, 2022) was performed to test H2, H4, H6 (see Figure 4, with an overview of all effects). The analysis indicated that there was a significant total effect of agency on transformative learning, $b = 0.36, SE = 0.17, BCa\ 95\% CI [0.04, 0.69]$. Therefore, H2 is supported. There was no significant direct effect of agency on transformative learning, $b = 0.28, SE = 0.17, BCa\ 95\% CI [-0.05, 0.61]$.

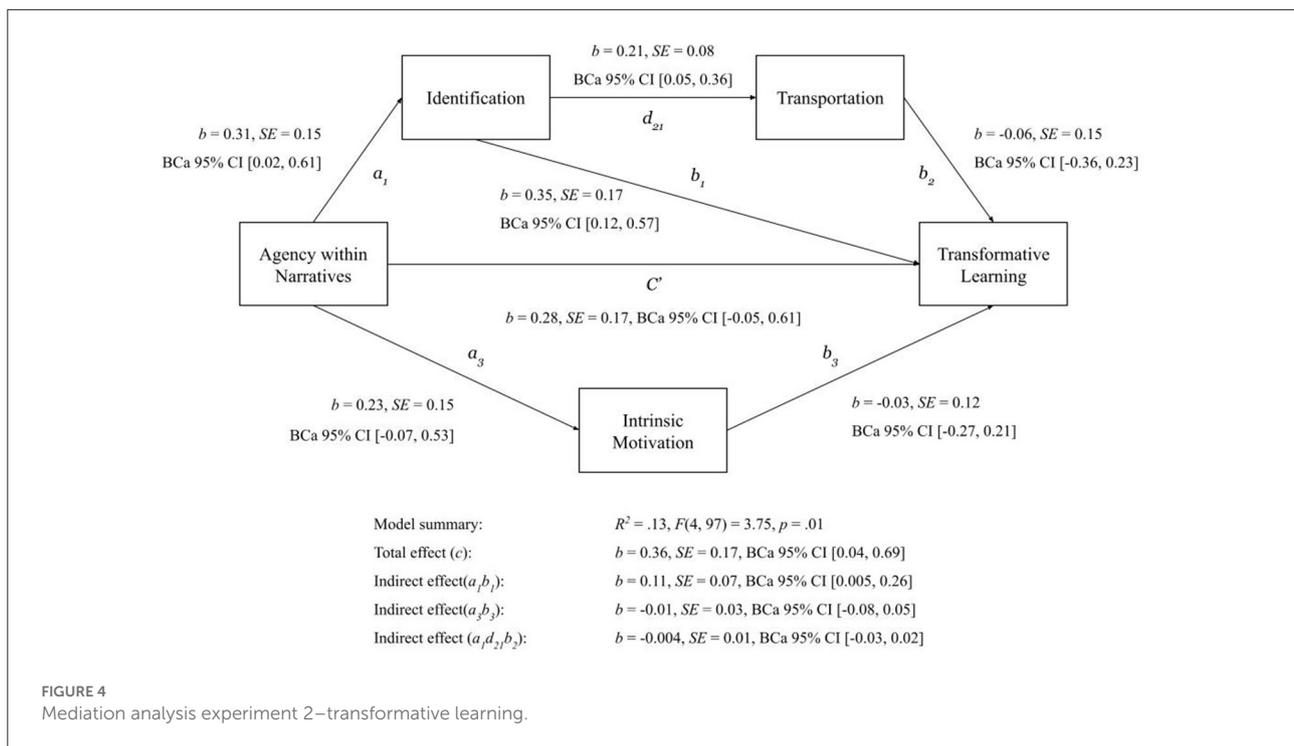
Moreover, there was no indirect effect of agency on transformative learning through identification and transportation, $b = -0.004, SE = 0.01, BCa\ 95\% CI [-0.03, 0.02]$, despite a positive direct effect of identification on transportation, $b = 0.21, SE = 0.08, BCa\ 95\% CI [0.05, 0.36]$. There was a significant indirect effect of agency on transformative learning through identification alone, $b = 0.11, SE = 0.07, BCa\ 95\% CI [0.005, 0.26]$. Therefore, the data partially supports H4. Agency does lead to a higher level of transformative learning, but this effect is only mediated by identification, not transportation. Furthermore, there was no indirect effect of agency on transformative learning through intrinsic motivation, $b = -0.01, SE = 0.03, BCa\ 95\% CI [-0.08, 0.05]$, leading to the rejection of H6. In summary, it can be concluded that the data supports H2 but not H6. However, H4 is partially supported as agency does affect transformative learning through identification but not through transportation.

Exploratory analyses

To explore whether cognitive learning and transformative learning differed for people who had ($n = 85$) or had no ($n = 13$) prior experience with depression and whether this experience influenced the effect of agency on cognitive learning and transformative learning respectively, two two-way ANOVAs were performed.

For cognitive learning, participants with prior experience ($M = 3.1, SD = 1.7$) had a higher difference score for cognitive learning than participants without prior experience ($M = 1.9, SD = 2.3$). The ANOVA showed a significant main effect of experience with depression, $F(1, 94) = 5.63, p = 0.02, \eta^2_{\text{partial}} = 0.06$. There was no significant interaction effect, $F(1, 94) = 0.13, p = 0.72$. The results indicate that people who had prior experience with depression learned significantly more from the narratives than people who had no prior experience with depression, but that experience with depression did not interact with agency in the effect on cognitive learning.

For transformative learning, participants with prior experience ($M = 3.1, SD = 0.9$) scored better on the transformative learning measure than participants without prior experience ($M = 2.7, SD = 0.9$). The ANOVA did not show a significant main effect of experience with depression, $F(1, 94) = 2.42, p = 0.12$. There was also no significant interaction effect, $F(1, 94) = 0.65, p = 0.42$. The results indicate that transformative learning did not differ between people with and without experience with depression and that experience



with depression did not interact with agency in its effect on transformative learning.

Discussion experiment 2

The aim of experiment 2 was to improve on the stimulus of experiment 1 and to investigate whether agency in narratives about depression affects cognitive learning and transformative learning and to what extent these effects are mediated by identification, transportation, and intrinsic motivation.

As with experiment 1, no effect of agency on cognitive learning (H1) was observed in experiment 2 even though a high level of perceived effectance could be achieved. Additionally, there was also no mediating effect of identification and transportation (H3) or intrinsic motivation (H5). Therefore, all findings of experiment 1 concerning cognitive learning were replicated despite all the improvements. One possible explanation is that a ceiling effect may have occurred. The participants who experienced the traditional version of *Cloudy* scored significantly higher on the cognitive learning questions than participants in the control group. However, adding agency to the narrative did not yield a significant difference. This indicates that the traditional narrative already increased the learning outcome to a point where agency did not provide an added value. Moreover, an exploratory analysis of prior experience with depression showed that most participants had prior experience with depression and that participants

with prior experience scored higher on cognitive learning than participants without prior experience. This may serve as an explanation for the lack of an effect of agency on cognitive learning.

In addition to the cognitive learning outcomes, the effect of agency on transformative learning was assessed. The findings suggest that narratives with agency positively affect transformative learning supporting H2. In addition, the hypothesis that the effect of agency within narratives on transformative learning is mediated by identification and transportation (H4) was partially supported as there was only an indirect effect of agency on transformative learning through identification. These findings can be explained by the fact that empathy (Taylor and Cranton, 2013) as well as perspective-taking (Jarvis, 2012) are parts of identification (De Graaf et al., 2012). Lastly, the hypothesis that the effect of agency within narratives on transformative learning is mediated by intrinsic motivation (H6) was not supported. Intrinsic motivation was elicited by the traditional as well as the interactive narrative and had no impact on transformative learning.

To investigate the effect of prior experience on transformative learning, an exploratory analysis was performed, which yielded no significant difference. This goes against the core idea of transformative learning that the reassessment of one's frame of reference is triggered by a disorienting dilemma, i.e., an unexpected, new incident (Mezirow, 1991).

In conclusion, experiment 2 replicated the insignificant effects of agency on cognitive learning. In contrast, the findings

did suggest a positive effect of agency on transformative learning through identification.

General discussion

The current study set out to investigate the effects of agency in a narrative about depression on cognitive learning (Bloom et al., 1956) and transformative learning (Mezirow, 2003; Taylor and Cranton, 2013). Furthermore, the mediating effects of the narrative constructs of identification and transportation (Green and Brock, 2000; Cohen, 2001; Green et al., 2004; Hand and Varan, 2009; Green and Jenkins, 2014; Brown, 2015; Cohen et al., 2015; Roth and Koenitz, 2016; Bilandzic and Busselle, 2017) and intrinsic motivation (Ryan and Deci, 2000; Katz and Assor, 2007; Patall et al., 2008; Rigby and Ryan, 2016; Sherrick et al., 2021) were investigated. We expected positive effects of agency on both cognitive learning (H1) and transformative learning (H2), as well as a positive serial mediation effect of identification and transportation (H3, H4) and a positive mediation effect of intrinsic motivation (H5, H6) on both learning outcomes.

Experiment 1 focused on cognitive learning as a dependent variable. Agency did not affect cognitive learning and no mediation effects of identification, transportation and intrinsic motivation were found (rejecting hypotheses 1, 3 and 5). This may have resulted from shortcomings in the design of the interactive narrative. Therefore, a new interactive narrative was created for experiment 2 improving on the integration of learning materials, choice relevance, and choice effectance. However, in experiment 2, we still did not find an effect of agency on cognitive learning nor any mediation effects (rejecting hypotheses 1, 3 and 5 again). These findings contrast with other previous studies, which have suggested that agency in narratives has a positive effect on cognitive learning (e.g., Hammond et al., 2007; Zhou et al., 2020). A possible explanation could be a ceiling effect. The participants who experienced the traditional version of the narrative scored higher on the cognitive learning questions than participants in the control group. However, adding agency to the narrative did not make a difference. This indicates that the traditional narrative already increased the learning outcome to a point where agency did not provide an added value. These results support previous findings concerning the effectiveness of traditional narratives in educational contexts in terms of comprehension and information retention (Mar et al., 2021). In the present study, we investigated the ceiling effect through an exploratory analysis of the effect of prior experience with depression on cognitive learning. Although prior experience did not affect cognitive learning in experiment 1, the results of experiment 2 did show that participants with prior experience scored higher than participants without prior experience. In both experiments, participants who had prior experience with depression largely outnumbered participants without prior experience with depression, meaning that this ceiling effect would apply to the majority of participants.

Therefore, it would be of interest for future research to investigate the effects of agency on cognitive learning using a topic of which participants have less baseline knowledge. Another explanation may be found in the education level of the current sample. Participants were mostly highly educated, having obtained a bachelor's or master's degree. A study by Lee et al. (2020) suggests that mental health literacy is higher in highly educated groups. Therefore, there is a bigger need in targeting less educated groups with mental health interventions. A last explanation could be that assuming a medium effect size was too optimistic. It may well be that the differences between narratives with and without agency are so small that a larger sample is required.

Experiment 2 added transformative learning as a dependent variable. The findings suggest that interactive narratives positively affect transformative learning (confirming hypothesis 2) and that this effect is mediated by identification (partially confirming hypothesis 4; see below). This is in line with theories about transformative learning, specifically regarding the importance of empathy (Taylor and Cranton, 2013) and perspective-taking (Jarvis, 2012), which are both components of identification (De Graaf et al., 2012). Perspective-taking was facilitated by directly assigning a role to interactors and enabling them to make choices on behalf of the friend (Green and Jenkins, 2014; Roth and Koenitz, 2016). The fact that the choices within the new version of the interactive narrative specifically pertain to interactions between characters might have further supported identification. Subsequently, identifying with the main character can shape attitudes and expand perspectives leading to the adoption of opinions, attitudes, and behaviors which are consistent with those described in the narrative (Hoeken and Fiekkers, 2014) resulting in a transformative experience (Hess et al., 2014; Knaak et al., 2016).

In contrast to cognitive learning, prior experience with depression did not affect transformative learning. This finding is consistent with the assumption made by Jarvis (2012), stating that the transformative potential of narratives persists both when dealing with experiences that are different as well as similar to our own. On the one hand, identifying with a character who is in a situation that is different from our own can result in transformation by experiencing a new perspective (a disorienting dilemma; Mezirow, 1991). On the other hand, identifying with a character that is in a situation that is similar to one's own can also trigger transformation. The latter is referred to by Jarvis (2012) as resonance. He argues that resonance can be elicited by exploring new solutions to the same struggles (Wright, 2007) or by increasing self-confidence and confidence in one's abilities (Burr, 2010). Future research could specifically compare transformative learning effects triggered by experiencing a differing situation from one's own compared to experiencing a similar one.

We hypothesized that a higher level of identification would lead to a higher level of transportation (Brown, 2015; Cohen et al., 2015; Bilandzic and Busselle, 2017). As described above,

we did find a mediation effect of agency on transformative learning via identification. However, no serial mediation took place via identification and transportation, hence providing only partial support for hypothesis 4. Tal-Or and Cohen (2010) argue that identification and transportation are two distinct processes. Whereas, identification is solely focused on a character, transportation pertains to a more general experience resulting from experiencing a narrative in its entirety. The kind of educational content presented in the narrative could serve as an explanation here. The interactive narrative in this study mostly deals with interpersonal interactions (i.e., how to act and what to say around someone struggling with depression). One could argue that identification is more relevant in this interaction-focused context than transportation.

Lastly, the current study also did not provide any evidence for a mediating effect of intrinsic motivation on transformative learning (rejecting hypothesis 6). Perceived autonomy (and effectance in experiment 2)–related to Self-Determination Theory’s needs for autonomy and competence respectively–were quite high in the interactive narrative and substantially higher than in the traditional one. Both constructs were operationalized through one item each which only related to the choices made in the narrative (e.g., “While reading the story, I felt like my choices had an impact on the events in the story”). Therefore, it is not clear whether, for instance, feeling like one’s choices have an impact on the events in the story directly equates to the overall satisfaction of the need for competence. A future study should also specifically measure perceived need satisfaction (Ryan and Deci, 2000; Gagne, 2003). Other than this, the operationalization of intrinsic motivation through enjoyment (Deci and Ryan, 1982) may serve as an explanation. Although the intrinsic motivation scores were on the high end of the scale in both experiments, asking participants about their enjoyment (“I enjoyed this way of learning very much”) may not have been appropriate for such a serious topic as depression, despite the fact that participants were deliberately asked about “this way of learning” instead of the topic. A think-aloud and interview study would be helpful to shed light on the thought processes of interactors and the extent to and manner in which agency in an interactive narrative drives interactors’ intrinsic motivation through need satisfaction (Rieger et al., 2022). Nonetheless, the fact that intrinsic motivation could be elicited in both experiments regardless of agency, may be an indication of the positive effect narratives can have on recipients, not just afterwards but already within the narrative experience. Satisfaction of the basic psychological needs (autonomy, competence, relatedness) goes together with an increase in subjective wellbeing (Ryan and Deci, 2011). A(n interactive) narrative in which a reader/interactor learns how to help a fictitious loved one who is struggling with depression can enable this need satisfaction and—with that—a sense of wellbeing (Weinstein and Ryan, 2010).

Limitations

The following limitations need to be taken into account. Both experiment 1 and 2 had an overrepresentation of participants who were highly educated and who had prior experience with the subject of the educational narrative. The skewness of the sample on these characteristics might have hampered cognitive learning effects and could have restricted the representativeness of the findings. Moreover, the decision to assume medium effect sizes for both power analyses might have been overly ambitious. As pointed out earlier, the samples of both experiments could have been too modest in size to expose subtle effects. On the other hand, medium and large effect sizes were found for the (in)direct effects on transformative learning, indicating that sample size is a more pressing concern when assessing cognitive learning, especially when the sample is highly educated and knowledgeable on the subject at hand. It is also noteworthy that the survey was exclusively distributed online due to the COVID-19 outbreak, resulting in diminished experimental control. Possible distractions might have decreased participants’ attentional focus, possibly influencing the results. To counter this, attention checks were included and responses that took unreasonably little or much time were excluded. Lastly, although perceived autonomy and effectance were assessed in the current study, it is not a given that the needs of the Self-Determination Theory are satisfied based on this assessment. Future studies are advised to measure need satisfaction directly (Rieger et al., 2022).

Conclusion

The present study investigated the effects of agency within narratives about depression on cognitive learning and transformative learning while taking the mediating effects of intrinsic motivation, identification and transportation into account. No effects of agency on cognitive learning were found in the two experiments, possibly because of the familiarity of the topic for the participants in this study. However, the results of the second experiment suggest that narratives with agency positively affect transformative learning and that this effect is mediated by identification. Being able to make choices on behalf of the caretaker led people to identify more with the role of caretaker and make them reflect on how to approach their depressed loved-ones in a sensible way. Transformative learning occurs irrespective of prior experience with depression implying that an interactive narrative can yield a new perspective on unfamiliar as well as on familiar situations. These findings can be used to inform the design of narrative mental health interventions. Emphasis should be put on the identification with characters to support their transformative potential. The choices within interactive narratives should have meaningful

consequences and should pertain to interpersonal interaction to support identification.

Data availability statement

The datasets and supplementary material presented in this study can be found at: <https://osf.io/mn5pb/>.

Ethics statement

The studies were reviewed and approved by the Research Ethics and Data Management Committee of the Tilburg School for Humanities and Digital Sciences (TSHD) at Tilburg University. The participants provided their written informed consent to participate in this study.

Author contributions

RE conceived of the original study concept. JS, MP, and RE developed the research design. JS oversaw data collection and

analyzed the data of experiment 1. MP oversaw data collection and analyzed the data of experiment 2. JS and MP wrote the manuscript with contributions from RE. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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