Dear members of the Editorial Board,

We are pleased to submit a study protocol paper entitled "Moving Stories: a study protocol on a game-based school program for depression literacy and stigma" by Anouk Tuijnman, Marloes Kleinjan, Evert Hoogendoorn, Isabela Granic and Rutger Engels for consideration for publication in the journal JMIR Research Protocols. We believe that this manuscript is suited for this journal as it provides a clear overview of a protocol for a study on the effects of an innovative newly developed program (which includes the use of a video game) in the field of mental health.

We declare that this manuscript has not been published and is not under consideration for publication elsewhere. All authors have approved of the manuscript and its submission to this journal. We agree to pay the Article Processing Fee in case of acceptance.

Thank you for your consideration.

Sincerely,

Anouk Tuijnman, MSc

PhD-candidate Behavioural Science Institute – Radboud University Nijmegen
Study Protocol Paper

Title:
Moving Stories: a study protocol on a game-based school program for depression literacy and stigma

Authors:
A. Tuijnman, MSc\textsuperscript{a,b}; prof dr. M. Kleinjan\textsuperscript{b,c}; E. Hoogendoorn, MA\textsuperscript{d}; prof. dr. I. Granic\textsuperscript{e}; prof. dr. R.C.M.E Engels\textsuperscript{e}
\textsuperscript{a} Behavioural Science Institute - Radboud University Nijmegen, 6525 HR Nijmegen, Netherlands
\textsuperscript{b} Trimbos Institute, 3521 VS Utrecht, Netherlands
\textsuperscript{c} University of Utrecht, 3512 JE Utrecht, Netherlands
\textsuperscript{d} IJsfontein, 1018 JA Amsterdam, Netherlands
\textsuperscript{e} Erasmus University Rotterdam, 3062 PA Rotterdam, Netherlands

Corresponding author's contact address:
A. Tuijnman, MSc
Behavioural Science Institute – Radboud University Nijmegen
Montessorilaan 3
6525 HR Nijmegen
+31 (0)24 3612076
a.tuijnman@pwo.ru.nl
Abstract

**Background:** The prevalence of elevated depressive symptoms among youth in most Western Societies is high. Yet, most adolescents who are experiencing depressive symptoms do not seek help. Low mental health literacy, high stigma and low social support have been shown to hinder help-seeking. A small number of interventions has been developed to target mental health literacy and stigma, but few focus on actual help-seeking and first aid behavior. We have developed a game-based school program called Moving Stories that targets mental health literacy and first aid skills in adolescents.

**Objective:** The present study will test the effectiveness of the program Moving Stories in an adolescent Dutch sample. We hypothesize that adolescents who participate in the program Moving Stories will have better mental health literacy and less stigma regarding depression compared to adolescents in the non-intervention control group at post-test, and 3- and 6-months follow-up. We also expect a positive change in actual help-seeking and first aid behavior at 3- and 6-months follow-up.

**Methods:** The effectiveness of Moving Stories is tested by means of a randomized controlled trial with two conditions: Moving Stories versus Control. Participants fill in questionnaires at pre- and post-test and at 3- and 6-months follow-up. A power analysis shows a required sample size of 180 adolescents.

**Results:** Four high schools have agreed to participate with ten classes. The last follow-up data will be collected in December 2018.

**Conclusions:** If Moving Stories proves to be effective, it could be implemented as a school-based program to target mental health literacy and stigma and in turn improve early help seeking. In the long-term, this could lead to better treatment responses and lower relapse numbers, benefiting not only individuals suffering from depression, but also society as a whole.

**Trial Registration:** Dutch Trial Register NTR7033; http://www.trialregister.nl/trialreg/admin/rctview.asp?TC=7033

**Keywords:** Depression; Help-Seeking Behavior; Helping Behavior; Health Literacy; Stigma; Video Games; Adolescence; Secondary Schools
Introduction
Depression is considered to be one of the leading causes of disability worldwide. A recent World Health Organization report indicated that 4.4% of the world population is suffering from a depressive disorder [1]. Although the prevalence of depressive disorders in youth is lower than in adults [1], the numbers of young people experiencing elevated depressive symptoms are substantial. In a recent large-scale European study, approximately 40% of adolescents were suffering from (sub)clinical depressive symptoms [2], which put them at increased risk for developing a depressive disorder in adulthood [3,4]. Furthermore, in adolescence, both symptoms of depression as well as a full-blown depressive disorder have been related to academic problems [5,6], social problems [5], physical problems, [5] and suicidal ideation [4]. In view of these long-term negative consequences, it seems important that young people seek the help they need to deal with depressive symptoms.

Even though many young people are experiencing depressive symptoms, over half of them do not seek help [7]. Some of the barriers to help-seeking are low mental health literacy, perceived stigma and a preference for self-reliance [7,8], while social support and encouragement by others to seek help are related to more help-seeking [7]. It is important to overcome these barriers and encourage social support, as prolonged time between depression onset and actual treatment leads to a worse response to treatment and a smaller chance of remission [9]. Considering the high prevalence of depressive symptoms, the negative consequences, and the benefits of seeking help early in the process, it is relevant to target the causes that hinder help-seeking behavior in young people. Consequently, we have developed Moving Stories, a game-based school program which targets both mental health literacy and stigma in young adolescents.

Mental Health Literacy and Stigma
Mental health literacy has been defined as "knowledge and beliefs about mental disorders which aid their recognition, management or prevention" [10, p. 182]. The main components of mental health literacy are: “(a) knowledge of how to prevent mental disorders, (b) recognition of when a disorder is developing, (c) knowledge of help-seeking options and treatments available, (d) knowledge of effective self-help strategies for milder problems, and (e) first aid skills to support others who are developing a mental disorder or are in a mental health crisis”. Mental health literacy therefore does not only refer to knowledge, but also to
connected actions [11], not only by those who need help, but, equally important, by the people close to them. In Moving Stories components (b), (c) and (e) are targeted.

With regard to recognizing a disorder, multiple studies have shown that both adolescents and adults find it difficult to recognize a mental health disorder [11,12]. Compared to adults, adolescents seem to be even less able to identify a disorder like depression [13]. Therefore, especially in adolescents, it is crucial that symptom and disorder recognition improve, as symptom recognition has been linked to choosing appropriate help and treatment [14].

Although it is beneficial for help-seeking behavior to increase people's ability to recognize a depressive disorder, labeling a person as mentally ill has also been linked to stigmatizing attitudes [15]. These attitudes, in turn, have been linked to less appropriate help offered to peers in need of help [16], possibly counteracting efforts to increase help-seeking. Stigma is also considered to be an important factor in why people who could benefit from help do not seek help or do not fully participate [17]. Consequently, this means that in targeting symptom recognition it is also necessary to focus on stigma.

One of the coping strategies that people with mental problems often use is finding social support. Most people view this type of help as potentially beneficial but it becomes of concern when they do this instead of seeking professional help [11]. Adolescents prefer seeking help from people they know [18,19] and they believe this help to be beneficial [20]. For adolescents, this becomes of specific concern, since their peers might not be able to provide sufficient or appropriate help [11]. Hence, adolescents could benefit greatly from knowing more about help-seeking options and treatments available. Moreover, teaching them how to provide appropriate first aid for mental health to their peers could further increase help-seeking among those who need it and improve support once their peers have received help.

Mental Health Literacy and Stigma Interventions

Although the research on mental health literacy interventions for youth is scarce, the few existing studies show promising results [12]. One example is of a school-based intervention consisting of short educational sessions in the class-room, involving a trainer who has personal experience with a mental disorder [21]. In a sample of 14-16 year-olds from the UK and Canada, findings showed an increase in mental health literacy after receiving the
intervention. A second school-based intervention with personal experience trainers targets symptom and disorder recognition with information-delivery sessions, videos and discussions, which proved to be effective in improving correct recognition in Australian adolescents between 14 and 18 years old [22]. A third school-based mental health literacy program consists of ten hours of class sessions about mood disorders and helping, with teachers providing the program. The program was associated with increased mental health literacy and decreased stigma in Australian 13-16 year-olds [23].

More recently, teen Mental Health First Aid was developed [24]; an adolescent version of the well-studied Mental Health First Aid training for adults [25]. A recent meta-analysis demonstrated that the adult training results in a decrease of negative attitudes and an increase of knowledge and supportive behaviors towards others with mental health problems [26]. For the recent adolescent version, a Delphi consensus study was conducted to find key messages to use in the training to help adolescents provide basic mental health first aid to their peers [27]. Based on those findings, a five-point action plan was developed that serves as the basis for the training. A first pilot showed promising results, with mental health literacy increasing and stigma decreasing in participating students [24].

The research on mental health literacy interventions is scarce, but more work has been conducted on the effectiveness of anti-stigma programs. Most studies on decreasing stigma in youth reveal that next to education, contact with an experience expert, a person who has suffered from a mental health disorder him- or herself, is related to decreases in stigma [28]. A meta-analysis showed that education and contact were equally effective in decreasing stigma [28], while a review showed that personal contact was more important in reducing stigma in young people [29].

Even though there are promising programs for mental health literacy and stigma in youth, there are still few interventions that target actual help-seeking behavior. Most intervention programs focus on enhancing knowledge, but not on enhancing behavioral styles [11]. We have developed a game-based school program, called Moving Stories. While most mental health literacy programs consist of didactic sessions, we argue that the nature of video games fits better with our goal of teaching skills alongside increasing knowledge. Already there are several examples of video games successfully teaching children health knowledge and skills (e.g. in cancer treatment specifically [30] and healthy lifestyles in general [31]). Games provide the opportunity to practice behavior in a relatively safe
engaging (virtual) environment and to learn by doing [32]. Moreover, players usually receive immediate feedback on their actions in games, encouraging them to continue and learn more [33]. Finally, games are an important part of young people’s lives [34], making a game-based intervention relevant for this population.

Moving Stories
Moving Stories is a game-based school program, which consists of three parts: 1) an introduction lesson, 2) a single player mobile 3D video game and 3) a contact session with someone who has experienced a depressive disorder. The program targets three components of mental health literacy, namely (1) recognition of when a disorder is developing, (2) knowledge of help-seeking options and treatments available, and (3) first aid skills to support others who are developing a mental disorder or are in a mental health crisis [10, p. 182].

Moreover, the program aims to decrease stigma around depression in youth. Moving Stories has been developed for high school students and should be offered to an entire class. In the introduction lesson, the students will download the game and will get a brief introduction about the game itself. In the game, players interact with a girl, Lisa, who is showing symptoms of depression. Hereby we aim to increase their ability to recognize depressive symptoms. Several help-seeking options and treatments are available in the game, such as contacting a school teacher or calling a phone help-line, and players can choose actions that are all related to good or bad first aid skills [27]. Players will get feedback on their chosen actions during the day by which we aim to increase their knowledge of help-seeking options and improve their first aid skills. The goal of the game is to build a relationship with Lisa by showing interest, trying to help her feel a little better and following up on promises. The end goal of the game is to get an adult involved, after discussing this with Lisa. After playing the game for five days the students will participate in a contact session with an experience expert who has suffered from depression. In this concluding session, the story of the girl in the game is brought to the real world. The program is delivered within one week, making it convenient to incorporate in schools.

Objective
The present study will test whether the game-based school program Moving Stories is effective in an adolescent Dutch population by means of a randomized controlled trial. Our
first hypothesis is that adolescents who have participated in the Moving Stories program have better mental health literacy and will endorse fewer stigmatizing attitudes regarding depression than adolescents who have not participated, both directly at post-test, and at 3- and 6-months follow-up. Second, we expect a change in help-seeking and first aid behavior. We expect that adolescents in the Moving Stories group, compared to the control group, will have sought more help if they were experiencing depressive symptoms or provided more appropriate first aid if they were in contact with a peer who was experiencing depressive symptoms, at 3- and 6-months follow-up.

**Methods**

**Design**

The effectiveness of Moving Stories is tested with a randomized controlled trial with two conditions: Moving Stories versus a non-intervention control group (see Figure 1 for the flow chart of the study design). We have chosen not to include a third condition with an alternative program because there is currently no mental health literacy program for young adolescents available in the Netherlands. Randomization is done within schools and between classes to avoid skewed distribution of participants over the two conditions due to school effects. The outcomes are measured (self-report) at four assessment points: T1 (pre-test: within one week before the start of the program), T2 (post-test: between one to two weeks after the start of the program), T3 (3-months follow up) and T4 (6-months follow up), with the exception of the behavioral outcomes, which are not assessed during post-test.
Procedure
Participants are adolescents in the second year of high school (12-15 years old). Schools in the Netherlands are approached and asked to participate with at least two second year classes, to allow for within-school randomization. Exclusion criteria are refusal from either the parent or the adolescent to participate.

After schools have agreed to participate, the classes are allocated to the MS or control condition by an independent researcher using computer-generated random numbers. All parents and adolescents in the participating classes receive an information letter via the school with information about the study. With the letter, parents receive a consent form,
which they have to sign and send back to give consent for their child’s participation. Before adolescents fill in the pre-test, they will also have to give written active consent for participation. All questionnaires (at all assessment points) are web-based and are either filled in at school or at home. To verify whether Moving Stories does not increase depressive symptoms or suicidal ideation in adolescents, the Child Depression Inventory (CDI; [35,36]) is administered. At all assessment points, if adolescents have a score on depressive symptoms in the clinical range and/or suicidal intention (CDI > 29 and/or a score of 2 on question 9 of the CDI; [35,36]), both the parents and adolescent are contacted by phone to inform them of the result and to give advice on where to seek professional help. They are not excluded from participating in the study, since that would increase stigma.

To make sure that all students who seek help from teachers during the study receive the help that they need, all teachers are provided with a for this study developed information booklet with short practical tips on what they can do to help their students. The primary researcher informs the teachers and other involved professionals at school during an information session about the study and the short practical tips. In addition, teachers have the opportunity to follow an e-learning program on suicidality and depression in youth. This program, called Mental Health Online [37], aims to improve knowledge and self-confidence in people working with youth and is found to be effective [38]. For the present study, the developers of Mental Health Online have added an information page on depression to the program, since the e-learning program mainly discusses suicidality in youth (in Dutch: [39]).

At pre-test, adolescents are provided with a participant number by the researcher to fill out the questionnaires. They also receive a personal player ID in the game. The data from the questionnaire and the data from the game will be matched. Adolescents fill in their name and contact information during pre-test, but this information can only be accessed by the primary researcher and data manager at the Trimbos Institute (Dutch National Institute on Mental Health and Addiction) for the purpose of calling adolescents and their parents in case of clinical depressive symptoms and/or suicidal ideation. Adolescents are reminded to fill in the questionnaires through email or by a phone call. Data will be stored on a secure server in accordance with the European privacy law.

Adolescents receive 12.50 euros for filling in all questionnaires at the four assessment points. Both parents and adolescents are allowed to withdraw their consent at any moment during the study, without consequences. Ethical approval for this study was provided by the
Measures

Descriptives
Socio-demographic variables include gender, age, ethnicity and current educational level. We measure prior gaming experience by asking participants if they play video games, on what platforms they play video games, and how many hours per week.

Depressive symptoms
The Child Depression Inventory [35,36] is used to control for depressive symptoms. The questionnaire consists of 27 items with each three statements. Participants are asked to pick the statement that best describes how they felt in the last two weeks. An example of an item with three statements is: “I sometimes feel sad; I often feel sad; I always feel sad.” Each statement corresponds with a score of 0, 1 or 2. The scores are added up to a total score for depressive symptoms.

Outcome measures
Mental health literacy is measured by: (1) symptom recognition, (2) first aid intentions, (3) knowledge of first aid, (4) first aid confidence, (5) beliefs about help, and (6) help-seeking intentions. Stigma is measured by (1) personal stigma, (2) perceived stigma and (3) social distance. For an overview of all measures that will be used and the assessment points see Table 1. All measures that did not have a Dutch version have been translated to Dutch and back translated to English by an independent researcher. Incongruences were discussed and resolved.
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Table 1. Measured variables at respective assessment points.

**Symptom recognition**

Symptom recognition is assessed by using three vignettes with gender-matched descriptions of 15-year old adolescents with depression, social anxiety and psychosis, respectively [40]. Participants are asked what might be going on with this person. Responses are open ended. All vignettes have been translated to Dutch and back translated to English by an independent researcher. Incongruences were discussed and resolved. The symptom “irritability” has been added to the depression vignette, since this is considered an important symptom in
adolescence [41]. Correct scores in the depression vignette are defined by labeling the person as depressed (or a related word to depression). Overestimation of depression is defined by labeling the person in the social anxiety and/or psychosis vignette as depressed (or a related word to depression).

For the following questions, the vignette of the person with depression will be used as an example.

**First aid confidence**
Confidence in providing first aid is measured by asking how confident they would be to help the person in the vignette if s/he was their friend (5-point scale from 1 “not at all confident” to 5 “very confident”) [24].

**First aid intentions**
To measure general first aid intentions participants are asked how much they agree with the statement “If [name vignette] was a friend, I would help him/her” (5-point scale from 1 “totally disagree” to 5 “totally agree”). Specific first aid intentions will be assessed by asking whether they would perform the mentioned first aid action “if [name vignette] was a friend” (5-point scale from 1 “never” to 5 “certainly”). In total, 6 helpful and 6 harmful actions are mentioned [42] and an open-ended option is provided (“I would do something else than the options mentioned above, namely…”). The scores for the harmful actions are reverse scored. An average score for first aid intentions is calculated by using the scores for the helpful and reversed harmful actions, with higher scores relating to better first aid intentions. Cronbach’s alpha is calculated.

**Beliefs about help**
Beliefs about help are assessed by asking whether the following people would make the situation of the person in the vignette “better”, “not better, not worse” or “worse”: (1) boyfriend or girlfriend; (2) friend (not related); (3) parent; (4) other relative; (5) psychologist or social worker (outside school); (6) phone helpline; (7) general practitioner; (8) teacher; (9) school welfare coordinator or school counsellor; (10) religious leader (e.g. priest, imam, rabbi); and who of those ten would be most helpful. The number of selected adult sources as helpful (“better”) is used to calculate beliefs about (appropriate) help (excluding “other relative”, since the category could include an adult or peer) [24].
Stigma
Both personal and perceived stigma will be measured with the Dutch Depression Stigma Scale [43]. Any mention of the word depression is substituted by the situation of the person in the vignette, e.g. "[name vignette] is dangerous.", similar to the procedure in [44]. The last two statements about hiring a person with depression and voting for them if they were a politician are not used, because we do not consider those relevant for this age group. Social distance is measured with the 5 items from the Social Distance Scale for youth [44]. Sum scores for four stigma scales are calculated, namely: (1) weak-not-sick, including the personal stigma items that concern the view that the person in the vignette is not ill, but his/her situation is due to weakness and (2) dangerous/unpredictable, including personal and perceived stigma items that concern the view that the person in the vignette is dangerous or unpredictable, (3) social distance, including all items from the Social Distance Scale and (4) reluctance to disclose, including the item "If I had the same problem as [name vignette] I would not tell anyone." [44].

First aid behavior
First aid behavior is measured by asking whether the participant has had contact with someone who has experienced a problem like in the vignette in the last three months. A problem is defined as when "someone has changed a lot in his/her normal thoughts, feelings and behavior, which made it hard for him/her to move on with his/her life. The situation did not solve itself and went on longer than you had expected". If the participant answers yes or maybe, they are asked whether they offered the other person their help. If so or if they are unsure, they are asked what they did (one or more of the 12 first aid actions and the open-ended option mentioned at First aid intentions). First aid behavior is calculated similar to First aid intentions [42].

Help-seeking intentions
Help-seeking intentions are measured using the General Help-Seeking Questionnaire [45], to which we added the options “teacher” and “school welfare coordinator/school counsellor” to match all sources of help to the Beliefs about help-items. Average scores for three categories are calculated: (1) general help-seeking intentions, (2) help-seeking intentions informal
sources and (3) help-seeking intentions formal sources. Higher scores indicate higher intentions. Cronbach’s alphas are calculated.

Help-seeking behavior
Help seeking behavior is assessed by asking whether the participant themselves has experienced a problem like in the situation of the vignette. If they respond positively, they are asked whether someone has helped them with this problem in the last three months and who (multiple options allowed). The same list of persons from the Beliefs about help and General Help Seeking Questionnaire is used with the additional option “Don’t know for sure”. If the participant indicates their boy/girlfriend and/or a friend has helped them they are asked what that person did (one or more of the 12 first aid actions and the open-ended option mentioned at First aid intentions).

Evaluation Moving Stories
During post-test, participants in the intervention group are asked to evaluate the program Moving Stories through seven items (e.g. “How much do you agree with the following statement: I would like to play the game another time to get a better score”; 5-point scale from 1 “totally disagree” to 5 “totally agree”). To distinguish between the different components of the program and study (game, evaluation contact session and research), the participants are also asked which of the components they would recommend to a friend if they would have the opportunity to participate in the study the next year.

Program
The program Moving Stories consists of an introduction lesson, a video game and a contact session. During the introduction lesson, adolescents who are in a class together are asked to download the game on their phone. Moving Stories can be downloaded from the Google Play Store or the App Store (IOS). All adolescents in the class receive a classroom password from the primary researcher to be able to play the game. This password is linked to their class schedule, allowing for joined playing time and feedback moments. The adolescents are able to watch an introduction video of the game at any time. The video game is about Lisa, who is the player’s cousin. The introduction video tells something about who she is and what the relationship between her and the player is. The video also shows that Lisa has not been feeling well lately. She has lost interest in most things, seems to be somber most of the time.
and since a few days has not come out of bed. The player is asked whether they could help her. After the video, the adolescents are told that they will play the game for five days. Each morning when they start the game, they will wake up in the house of Lisa and will be able to do five things for her (e.g. getting her something to drink). Some of those actions are positive, others are negative. After they have chosen five actions, they go to school and the day starts. During the day on set moments they will get feedback from Lisa about what they did in the game through automated text messages. They will earn points for their actions and together these points add up to a total Relationship-score, which is shown in the menu of the game. That score illustrates the quality of their relationship with Lisa. The adolescents are also told that they could share the messages with each other and that sharing those might give them more information about the game and improve their skills in the game faster. Last, they are told that if they have questions or want to discuss what they have seen in the game before the contact session at the end of the intervention, they can go to their school welfare coordinator or school counsellor.

The video game has a menu (see Figure 2) with buttons to access the house and the messages of Lisa and a meter for the Relationship-score. The menu also shows which of the five playing days it is and there is an info button that will lead them to an info page in the game. The info page shows their personal ID and has a button they can press when they “feel like giving up on life”. They are then immediately brought to the website of 113 Zelfmoordpreventie (Suicide Prevention), the Dutch organization for suicide prevention, where they can chat or call with a trained volunteer.

Figure 2: Menu (translation: “The house is open from 07.00 till 11.00. You have to wait 00:28 minutes”).

In the house (see Figure 3) players can walk around, examine objects, talk to Lisa and perform actions. There is no limit to walking, examining or talking, but players will only be
able to perform five actions a day. Once they have done those five actions they are asked whether they want to go to school or redo the day. During the day, the entire class will get personal messages at the same time from Lisa, with feedback on their personal actions through text messages. Those feedback moments are mainly scheduled in break times, so the adolescents have the opportunity to discuss the messages and talk about game strategies. At a Relationship-score of 50 Lisa will get out of bed. At Relationship-score 95 Lisa is willing to talk to an adult about what is going on. Only when the player has discussed this with her and she mentions she is willing, the action of calling an adult will be rated positively.

The game is completed successfully if the player is able to get Lisa to ask for help from an adult. After five (school)days of playing, all players see a last scene that takes place a few months in the future. Lisa tells the player that she got help and she is getting better. Based on the final Relationship-score Lisa will thank the player for their efforts during the time they were in the house and will give specific feedback on what the player could have done to help her.

![Figure 3: Bedroom of Lisa.](image)

After five days of playing, the program is finished with a contact session. An experience expert who has had depression leads the contact session. All experience experts are trained by the Trimbos Institute in telling their story, guiding a discussion about the game and translating their story and that of the game to specific first aid skills. In the session, the experience expert tells their own story and will use the experiences of the adolescents in the game to discuss five first aid skills the adolescents can go back to when they want to help a friend who might be suffering from depression. Those points were based on the message of the teen Mental Health First Aid Training [24] and translated to Dutch: (1) Look for warning signs, (2) Ask how they are, (3) Listen without judgement (the latter was added specifically in this program), (4) Help them connect with an adult and (5) Be a friend. During the contact
session adolescents are allowed to ask questions, about the game and about the experience of the expert.

Moving Stories has been developed through a close collaboration between game designers and behavioral scientists using an iterative design process (see Figure 4). All stakeholder groups have been involved during each development phase, including youth, therapists and teachers. The concept of the game was based on current literature and best practice experiences. In total, five iteration rounds were run through, each with several playtests. Over 200 people played the game before final development.

Figure 4: Iterative design process Moving Stories.

Sample Size
The sample size is based on the expected difference (Cohen’s $d = .40$) between the intervention and control condition for mental health literacy and stigma at 3-months follow-up (based on [23]). We have performed a power analysis using Stata 14.2 [46] assuming baseline adjusted regression analyses ($\alpha = .05$; $\beta = .20$). Our provisional estimates for the correlations between pre- and post-test and between post-test and 3-months follow-up are $.50$. A coefficient of variation of $.19$ (estimated mean cluster size = 18; estimated cluster size range = $11 - 25$; [47]) and an intra-cluster correlation coefficient of $0.02$ [23] lead to a design effect of 1.35. Taking into account the design effect, we have calculated that we need 3.75 classes per condition to show the expected effect, rounding up to four classes per condition.
(with 18 adolescents per class). To adjust for a t-distribution [48] we have added one class per condition, leading to five classes (90 adolescents) per condition and a total necessary sample size of 180. Since we perform the analyses according to the intention-to-treat principle drop-out was not taken into account.

**Statistical Analyses**
Descriptive statistics will be calculated for all variables of interest (e.g., knowledge of first aid, stigma, help-seeking intentions). In order to assess whether randomization results in similar groups, we examine whether there are differences between the two conditions on relevant covariates (sex, age, educational level, ethnicity, gaming behavior and depressive symptoms) using T-tests for the continuous variables and Chi-Square tests for the categorical variables. Variables that are distributed differently between the two conditions will be entered as control variables in all models testing the effects of the conditions.

We will perform our analyses according to the intention-to-treat principle, meaning we will include all children who filled in the pre-test in the analyses to test the study hypotheses. We will control for clustered data, because children are nested within classes. We will use Mplus [49] for the analyses, since it has special features to deal with missing data. It also allows for analyzing complex data while controlling for clustering. To test whether children in the experimental condition show a stronger increase in mental health literacy and a stronger decrease in stigma at 3- and 6-months follow-up (compared to the control condition) regression analyses will be conducted. Both the effect sizes and the confidence intervals will be reported.

**Results**
Currently, four schools and ten classes have agreed to participate in the study. The last follow-up data will be collected in December 2018.

**Discussion**
This is the first study to test the effectiveness of the mental health literacy program Moving Stories, which not only targets knowledge and beliefs, but also aims at training both help-seeking and first aid behavior. This project is unique in its use of an online game to teach mental health literacy. Moreover, the program has been designed by professional game designers in close collaboration with relevant stakeholders. We use a rigorous experimental
design to answer our research questions. Our study adds to the current literature on mental health literacy, as there is a lack of intervention studies in adolescents.

Since we randomize within schools and between classes, there is a risk of contamination between the classes. However, considering the needed sample size, randomizing between schools would potentially lead to large school differences and we have estimated the risk of contamination to be lower than the between school effect. Another limitation is that we are unable to assess objectively what the adolescents discuss outside the game. We will only measure what they do in the game, and assess outcomes through self-report questionnaires, therefore we are unable to say something about the possible effect of these discussions.

If Moving Stories proves to be effective, it could be implemented as a school-based program to target mental health literacy and stigma and in turn improve early help seeking. Combining the program with screening questionnaires on depression could further aid early detection of mental health problems in adolescents. In the long-term this could lead to better treatment responses and lower relapse numbers. This will not only benefit the individuals potentially suffering from depression, but also society as a whole [50].

Funding, development and conflicts of interest
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Roles
Author AT is the primary researcher on this study. She has also been part of the development of Moving Stories. EH works at IJsfontein and was lead designer on the development of Moving Stories. Authors RE, IG and MK are supervisors of AT. IG and RE have had an advisory role in the development of Moving Stories.
Appendices

Appendix 1: Information letters for parents and adolescents (translated to English)

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