Contents and Characteristics of Mental Imagery and their Association with Emotional Intensity in Adolescents: A Pilot Study

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Abstract

The contents and characteristics of mental imagery (MI) have been investigated with respect to a few mental disorders, but not yet in healthy samples. In adults, it was found that characteristics like the vividness and perspective of MI might be associated with emotions and emotional distress, a matter which needs to be examined in youths. A sample of 80 adolescents (14–20 years; 75.3% female) completed a web-based quasi-experimental design about the contents, and characteristics (frequency, vividness, perspective, controllability) of spontaneous positive and negative MI and emotional distress and emotions, as well as the *Beck Depression Inventory* and the *Social Phobia Inventory*. Adolescents described mental images primarily about social themes and those participants experiencing images about social conflicts reported higher levels of emotional distress. Participants reported perceiving images in a combination of field- and observer perspective also stated a higher score of anxiety. A higher frequency, vividness and less control over negative images were significantly linked to a higher intensity of emotional distress and anxiety. A higher frequency, vividness and a higher level of control over positive images were significantly linked to a higher intensity of joy. Small sample size and high social status of participants limits generalizability. Findings indicate that encouraging young people to create vivid positive images and to use a training to increase control over MI might be useful to increase mental health. The results do not permit causal conclusions to be drawn, but raise questions about previous studies comparing each imagery perspective individually.

Keywords Mental imagery · Emotions · Children · Adolescents · Treatment

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Introduction

Mental imagery (MI) is an essential part of human thinking (Clifton et al., 1991; McCarthy et al., 2001; Piaget, 1974) and is closely associated with emotions; negative feelings like sadness, anger, shame, disgust and fear, but also pleasant ones like joy (e.g., Blackwell, 2019; Holmes & Matthews, 2010). Especially when experiencing intensive feelings, information processing may be characterized more by MI than by logical-rational cognitive processing (Gadeikis et al., 2017; Seebauer et al., 2016), and might stimulate physiological responses that are often beyond conscious control (Papadelis et al., 2007). Mental images are often based on memories, but may also refer to a future event (Hales et al., 2011). For example, thinking about a future moment of glory is associated with positive emotions. This can be useful and relaxing, but MI may also be associated with intensive strain and negative feelings if people think about unpleasant events. Having intrusive images about a traumatic event, so called "flashbacks" is also a symptom for posttraumatic stress disorder (PTSD; Holmes & Matthews, 2010). But mental images do not only occur in PTSD. The potentially important role of negative MI as a maintenance factor of psychological disorders has been supported in studies with adults suffering from PTSD (e.g., Cockerham et al., 2016), obsessive-compulsive disorder (OCD; e.g., Speckens et al. 2007), social anxiety disorder (SAD, e.g., Hackmann et al., 2000), agoraphobia (Day et al., 2004), body dysmorphic disorders (Ritter & Stangier, 2016), and depression (e.g., Weßlau & Steil, 2014). Many mental health problems have their onset in adolescence (Paus et al., 2008). It therefore makes sense to examine the mental images in this age group as well. For adolescents, however, the study situation is significantly worse than for adults, and basic research on the underlying mechanisms of the associations between MI and emotions is almost completely lacking.

Schwarz et al. (2020) state in their comprehensive review, that MI seems to contribute to the maintenance of social anxiety disorder and depression. In addition, they showed, that if adapted to the developmental stages of children, interventions targeting MI (like imagery rescripting) are effective in the treatment of mental disorders. Consequently, MI appears to be a relevant factor for mental disorders in children and adolescents (Schwarz et al., 2020). To treat these disorders with these methods in an effective and efficient way, it is important to understand the processes leading to such emotional dysfunctions and intrusive mental images (Holmes & Matthews, 2010).

So far, neither a study exploring imagery content, nor the differences in associated emotions between contents and characteristics of MI in healthy adolescents (or adults), could be found. Therefore, this present investigation is part of the fundamental research on the association between mental images and emotions. Besides the content of MI, different characteristics like the perspective from which the image is perceived, vividness, frequency and subjectively perceived controllability might also be linked to emotional distress and emotions. The current state of research on these associations are described in the following section.

Theory

Content of Mental Imagery

Regarding content of MI, research showed that in PTSD, the content of MI involves aspects of the experienced trauma (American Psychiatric Association, 2013). In other mental disorders, the content of MI is affected by the underlying fears or concerns. Adolescents and adults with SAD reported having images in their minds of *being criticized* or *others drawing attention to an anxiety symptom*, or images of past situations when experiencing *disregard or disinterest from others* (adults: Hackmann et al., 2000; adolescents: Schreiber & Steil, 2013) As adolescence is known to be a phase in life during which acceptance by other people is important and social withdrawal hurts especially (Blakemore & Choudhury, 2006; Lynn Mulvey et al., 2017; Sebastian et al., 2011), these themes might be frequent and also very distressing in adolescents without a mental disorder.

Muse et al. (2010) categorized the mental images of 55 patients with hypochondriasis. Themes about the *impact of one's own death or of serious illness on loved ones*, as well as *dying due to illness* were found. In patients with agoraphobia, themes included *mental or physical catastrophe*, *disorientation* and *absence of people who will help* (Day et al., 2004). Speckens et al. (2007) reported examples of recurrent images in patients with OCD of being *dirty because they are covered in urine*. These negative mental images are mainly based on bad childhood memories which occurred at about the time of the onset of the disorder (e.g., Day et al., 2004; Hackmann et al., 2000) suggesting to investigate MI in childhood and adolescents.

Characteristics of Mental Imagery

Concerning characteristics of MI, studies were found investigating the effect of perspective, vividness and frequency. Accordingly, different perspective options (field- and observer perspective) seem to mediate the link between MI and emotions. Burnett Heyes et al. (2017) are the first and only ones examining the link between perspective and associated emotions in adolescents. Sixty male adolescents (aged 11 to 16 years) had to complete a computer-based training in which the participants were asked to imagine positive or negative image-word pairs (e.g., the image of a rain cloud was presented together with the word "refreshing" for a positive valence and with "cold and wet" for a rather negative valence). Positive mood increased especially after positive images generated from the field perspective but not from the observer perspective (Burnett Heyes et al., 2017).

In adults, the perspective of MI was investigated more frequent. Studies indicated that field perspective was linked to stronger positive feelings than MI experienced from an observer perspective (Holmes et al., 2008). Studies examining the perspective in negative images (Williams & Moulds, 2007) and positive memories as well as prospective images (Vella & Moulds, 2013), showed that switching from field- to observer perspective reduces associated emotions. In contrast, switching from observer to field perspective does not necessarily lead to a strengthening of these variables. The observer perspective is also considered to be part of a cognitive avoid-

ance tendency of adult patients, as a more frequent use of the observer perspective is reported in patients with PTSD (e.g., adults: McIsaac & Eich, 2004) and SAD (e.g., adults: Hackmann et al., 2000; adolescence: Schreiber & Steil, 2013). The observer perspective might therefore be an important maintaining factor (Kenny & Bryant, 2007). Accordingly, different types of perspective seem to be linked to different levels of associated emotions.

Furthermore, there is evidence that higher levels of vividness and more frequent negative MI might be associated with greater emotional distress. Only one study explored the link between vividness and emotions in children. McKinnon et al. (2008) investigated unpleasant mental imagery in 75 children and adolescents (aged 7–16), who experienced an injury which led to hospital treatment. A greater vividness of MI was significantly linked to higher levels of associated anxiety. This is in accordance with findings from the adult area (e.g., Holmes et al., 2016; Moritz et al., 2014).

Further studies in children and adolescents only investigated the connection between vividness and frequency with psychopathological symptoms, but not with associated emotions. Since the studies also examined the connection between psychopathological symptoms and emotional stress, the results from children and adolescent area are briefly summarized. Symptoms of SAD (Hignett & Cartwright-Hatton, 2008; Schreiber & Steil, 2013) and depression (Kuyken & Howell, 2006; Pile & Lau, 2018) were associated with more frequent, more vivid, and emotionally stressful negative mental self-images. Therefore, the assumption that a higher vividness-level and more frequent MI are linked to higher levels of emotions can be made but needs to be checked.

In terms of the relationship between controllability of MI, no study was found investigating the link to associated emotions. In psychopathology, such as in PTSD (adults: Cockerham et al., 2016; adolescents: McKinnon et al., 2008) or in depression (e.g. adults: Weßlau & Steil, 2014; adolescents: Meiser-Stedman et al., 2012) mental images are often described as "intrusive" or "beyond control". According to Grawe (2000), subjectively perceived control over psychological and physical processes is a basic need. Having no control over psychological processes, as it appears in intrusive MI, might consequently be associated with anxiety. No study investigated this association so far.

Objectives and Hypotheses

Our study aims to identify themes of spontaneous positive and negative MI in adolescents and to examine the link between content as well as characteristics (perspective, frequency, vividness, controllability) with emotional distress and associated emotions. To involve a wide range of potentially related emotions, the intensity of the subsequent emotions had to be rated: joy, anxiety, sadness, anger, disgust, feelings of guilt and shame.

Certain themes might be associated with higher levels of joy (for positive imagery) or higher levels of emotional distress and negative emotions (for negative images). For negative images, we hypothesized that imagery with contents such as social conflicts are associated with higher levels of emotional distress and negative emotions. Concerning the use of perspective, we postulated that adolescents who report

the use of a field perspective in negative images would also report higher levels of emotional distress and negative emotions (e.g., Holmes et al., 2008). As an observer perspective is part of a cognitive avoidance of intensive emotions (Kenny & Bryant, 2007), we hypothesized that adolescents who report perceiving images from a field perspective will especially report a higher level of anxiety. For positive images, we assumed that adolescents reporting a field perspective would also describe to experience higher levels of joy. Furthermore, we anticipated that higher levels of vividness and frequency are linked to higher levels of emotional distress and associated emotions (McKinnon et al., 2008).

Exploratively, we investigated the association between subjectively perceived control over positive and negative MI and emotions and distress, and hypothesized that less control is associated with higher levels of associated anxiety and distress in negative MI and associated with higher levels of joy in positive MI. The study presented below constructs the basis for the investigation on MI and social pain, in which the association between the characteristics and MI and the construct of social pain was assessed (see Schwarz et al., 2021).

Material and Methods

We present data from an anonymous web-based study examining $N = 80$ adolescents, aged 14 to 20 years. The assessment was conducted using *unipark* (QuestBack GmbH, Germany), an online survey software program. Participants were asked to generate two self-selected spontaneous images, a positive and a negative one. Afterwards they were requested to describe what they experienced in every sensory quality (visual, auditory, gustatory and olfactory properties, physical sensations and tactile impressions), the intensity of emotions (joy, fear, anger, sadness, disgust, shame, feelings of guilt), as well as the vividness and imagery perspective of the two images. They also had to complete questionnaires about depressive and social anxiety symptoms. Participants specified whether or not their parents had agreed to the participation. Data obtained without parental consent was deleted. Permission from an ethics committee was obtained prior to the start of the study.

Material

Mental Imagery and Associated Emotions were measured using the *Mental Imagery Questionnaire for Youths (MIQ-Y, adapted by Schwarz & Schreiber,2016; based on Hackmann et al.,2000)*. The MIQ-Y general structure was based on the items used in the *Imagery Interview* from Hackmann et al. (2000). A general description of a mental image was provided (e.g., *Mental images are pictures which we can see with our "inner eye" - like a photo or a film in our heads. These mental images can refer to past events, the present or the future. They can be pleasant or uncomfortable, even horrible.* Afterwards, participants were asked to imagine and describe two self-selected spontaneous mental images, first a positive one, and afterwards, a negative one. After each specific image, they described what they experienced with respect to each sensoric impression (such as *How clearly did you see this image*?) and rated the

clarity and vividness on a five-step scale (from 1=*no image at all* to 5=*as vivid as real life*), and also the strength of the associated emotions, controllability on a scale from *0* (no associated emotions, no distress, no control) to *10* (very strong emotions, high distress, full control). Respondents were also asked for the perspective (field, observer, combination of field and observer, not specified). Furthermore, participants reported the frequency of occurrence in the last six months (from 1=*almost never* to 5=*always, at least once a day*).

Depressive Symptoms were recorded using the *Beck Depression Inventory (BDI-II; Beck et al.,* 1996*)*. The inventory consists of twenty-one items with 4 statements each. The participants have to decide on one of the 4 statements (such as *I don't cry any more than I used to* or *I cry more than I used to* or *I cry over every little thing* or *I feel like crying, but I can't)*. The BDI-II is reliable instrument for assessing depressive symptoms (from 13 years onwards, Hautzinger et al., 2006). Scores of ≥20 indicate moderate depression (Hautzinger et al., 2006). The BDI-II was found to have a Cronbach's $\alpha \geq 0.84$ as well as acceptable content validity and appropriate retest-reliability in clinical and non-clinical samples (Kühner et al., 2007).

Social Phobia Symptoms were measured with the *Social Phobia Inventory (SPIN; originally developed by* Connor et al., 2000; *German version by* Consbruch et al., 2016). The German version of the SPIN consists of 17 items (such as *I am afraid of doing something when other people are watching me).* Participants rate these items on a 5-point Likert scale ranging from 1 (not stressful) to 5 (extremely stressful). Scores of ≥25 indicate a diagnosis of social phobia. The measure displays high internal consistency (Cronbach's $\alpha = 0.89$ and $\alpha = 0.95$) and good retest reliability $r_{tt} = 0.85$ in populations aged 14 to 93 years (Consbruch et al., 2016).

Methods

Procedure and Recruitment Before starting the online survey, pilot data was collected for four adolescents (14 to 20 years old) in order to test the comprehensibility of the MI questionnaire, which had not yet been used in an adolescent group. The time needed to complete the questionnaire was also stipulated. Participants were recruited using social media websites, local soccer-clubs and bulletin boards. Furthermore, flyers were spread outlining the goals of the study, as well as a QR-Code and hyperlink to the homepage of the online survey. With an expected pearson correlation of $r = .4$ (medium correlation), a statistical power of 0.9 and $\alpha = 0.05$, a minimum sample size of $n = 61$ would be needed. The survey started with a description of the study goals and participants were requested to provide informed consent. Socio-demographic variables including age, gender, type of school and mother tongue were requested. The online survey was conducted between January and July 2019. To increase motivation for participation, an iPad and cinema tickets were raffled. The email-addresses (to contact the winners) of this raffle were saved completely independently of the questionnaire's responses, so as to ensure anonymity.

Participants The first page of the online assessment was called up $n=436$ times. Informed consent was provided by $n=149$, and of the starters, $n=80$ (54%) participants completed the full survey. Participants were excluded if they had indicated that they were visiting a special school, were currently experiencing an acute suicidal crisis. The required time for completing the assessments varied from 35 to 60 min. The mean age of participants was 17.66 years ($SD=1.76$; range: 14–20; 75.3% girls, $n=61$). Regarding education, 46 adolescents stated attending a high school, 26 attending university, seven participants were undertaking some form of training, and one adolescent was already working. Furthermore, 18 adolescents stated having an immigration background. The descriptive analysis of the questionnaires assessing psychopathological symptoms showed that 18% ($n=15$) of the participants score ≥ 20 in the BDI, and 20% ($n=17$) yielded SPIN scores of ≥ 25. Accordingly, the sample also included participants with more severe psychopathological symptoms.

Statistical Analysis Prior to data analysis, participants were screened on the basis of previously outlined exclusion criteria, and the data set was checked for completeness and correctness, and for fit between the distributions and the assumptions of multivariate analysis, according to Tabachnick and Fidell (2012). All the responses were 'forced-choice,' therefore no missing data were created. One participant had to be excluded due to a failure to obtain parental agreement. We also checked and can confirm that our data meet the requirements (homogeneous variability and normal distributions) for the parametric analysis. For all data analysis such as the -tests, ANCOVAS, MANCOVAS and correlations, we used SPSS Statistics 28.

To identify themes and investigate whether or not the content was linked to different levels of associated emotions, a qualitative analysis was conducted prior the quantitative analysis. The different descriptions of the participants were divided into superordinate categories according to Mayring (2016), based on an inductive procedure. The two superordinate categories for positive images were *social reward* and *physical reward.* For negative images, the two superordinate categories were *physical threat* and *interpersonal threat.* Participants' responses were therefore screened according to whether they included social/interpersonal or physical issues. The answers were then assigned to two superordinate categories and afterwards divided into subcategories based on a deductive procedure. The answers of participants were later coded by naive raters into one of the categories. We found an excellent inter-rater reliability for positive images (Cohens-*kappa*$=0.948$) and negative images (Cohens-*kappa*$=0.929$).

Five categories for positive images (social reward: *enjoying time with family or friends, romantic situations;* physical reward: *enjoying nature, practicing sports*) and seven categories for negative images (interpersonal threat: *conflicts with friends/family, death of a close relative, loneliness, failure in a performance situation, social embarrassment;* physical threat: *unintended/accidental physical injury of oneself; physical harm of another person*) were identified (see Tables 1 and 2). A one-sample χ^2-test was conducted to examine whether mental images with social themes (social reward for positive MI and interpersonal conflicts for negative MI) were mentioned

significantly more often than mental images with a physical theme (physical reward and threat).

As depressive- and social anxiety symptoms might affect the relationship between characteristics of MI and associated emotions (e.g., Meiser-Stedman et al., 2012; Schreiber & Steil, 2013) and our sample scores regarding those symptoms, depression (BDI-scores) and social anxiety scores (SPIN-scores) were included as covariates in subsequent comparisons between the different images. To answer the question of which theme in positive images was associated with higher levels of joy, we first conducted an ANCOVA with the two *superordinate categories* (social and physical reward) as independent variables and associated *joy* as dependent variable. We then conducted one more ANCOVA with the different *subcategories* (four categories) as independent variables and *joy* as dependent variable, to compare the subcategories more specifically. To test which theme of negative images was associated with high levels of negative emotions, we constructed a *mean* which consisted of all ratings for negative emotions (anxiety, sadness, anger, disgust, shame, feelings of guilt). A MANCOVA with the two superordinate categories (physical/interpersonal threat) as independent variables and *emotional distress* and the calculated *mean negative emotions* as dependent variables was conducted to examine the difference between these two categories. We also conducted a MANCOVA with the different *subcategories* as independent variables, and *distress* and the calculated *mean negative emotions* as dependent variables, in order to examine differences between the seven subcategories.

In order to test the differences in *emotional distress* and *mean of negative emotions* between different types of *perspective* (field perspective, observer perspective, combination of field and observer perspective), we conducted a MANCOVA with *perspective* as the independent variable and *emotional distress* and *mean of negative emotions* as the dependent variables for negative images. Because it is assumed that an observer perspective is part of cognitive avoidance, we hypothesized that especially a high score for anxiety would be reported among participants experiencing the image in an observer perspective. To test this hypothesis, we conducted an ANCOVA, with *perspective* as the independent variable and *anxiety* as the dependent variable for negative images. For positive images, we conducted an ANCOVA with *perspective* as the independent variable and *joy* as the dependent variable. The association between *frequency* (scale from 1=*almost never* to 5=*always*), *vividness* (scale from 1=*no image at all* to 5=*as vivid as real life*) and *controllability* (scale from 0=*no control* to 10=*full control*) and reported *joy* (for positive images) as well as *emotional distress, anxiety, anger, sadness, disgust, shame and guilt* (for negative images) were investigated with correlation analysis.

Each statistical calculation was conducted twice, once for positive images and once for negative images. For the statistical analysis of positive images, we used all those who reported having positive images ($n=76$), and for the statistical analysis of negative images, we used all adolescents who reported having negative images ($n=67$).

Results

Positive Mental Imagery

Content A one-sample -test showed that mental images with social themes were mentioned significantly more often ($p=.021$) than images with a physical theme. The frequency distribution of themes showed that most adolescents report images about *enjoying time with family or friends* (38.75%). Table 1 shows themes, associated examples for an image and the frequency distribution, as well as associated joy for positive images.

An ANCOVA with BDI- and SPIN-scores as covariates was conducted to examine the difference between the two *superordinate categories* (as independent variables) on the dependent variable *joy*. No significant difference between *physical reward* and *social reward* was found ($F_{(1,73)}$ 0.009; $p=.926$; $\eta^2=0.000$). One more ANCOVA was conducted to test the differences between *subcategories* (four subcategories) as independent variables on *joy* as the dependent variable. No significant main effect of content ($F_{(3, 70)}$ 0.876; $p=.458$; $\eta^2=0.036$) was found for *joy*.

Characteristics In order to examine the differences between types of perspective (independent variable) on the dependent variable *joy*, we conducted an ANCOVA with BDI and SPIN-scores as covariates. No significant main effect of *perspective* ($F_{(2, 72)}$ 0.23; $p=.798$; $\eta^2=0.006$) was found. To examine the association between *frequency, vividness, controllability* and *joy*, a partial correlation analysis with *joy* were conducted. Significant moderate correlations were found for *frequency* and *joy* ($r=.48$, $p\le.001$). Significant high correlations were found for *vividness* and *joy* ($r=.62$, $p\le.001$), and for *controllability* and *joy* ($r=.53$, $p\le.001$). A higher score

Table 1 Content of positive mental imagery in youths

Content of positive images	Frequency distribution n (%)	Levels of associated *Joy* M (SD)
Social reward	47 (58.75%)	7.60 (2.08)
Enjoying time with family or friends (e.g. "*it's Christmas eve and I'm playing ball with my grandpa*")	31	7.77 (1.96)
Romantic situation (e.g. "*kissing my girlfriend, smelling her perfume and feeling her lips*")	16	7.31 (2.39)
Physical reward	29 (36.25%)	7.64 (1.81)
Enjoying nature (e.g. "w*alking through the forest in good weather and enjoy the fresh air*")	21	7.33 (1.62)
Practicing sports (*e.g. "being on a horse farm and taking care of my favorite pony*")	8	8.38 (2.07)
No image	4 (5%)	

Note. Content of positive mental images in an adolescent sample ($n=80$) aged 14–20 years old and associated joy

of *joy* was therefore associated with a higher score for *vividness*, *frequency* and *controllability*.

Negative Mental Imagery

Content A one-sample -test showed that mental images with social themes were mentioned significantly more often ($p=.037$) than images with a physical theme. Most adolescents reported having images about *conflicts with friends/family* (21.25%). Frequency distribution and reported emotional distress and associated negative emotions (calculated *mean negative emotions*) for negative images are shown in Table 2. A MANCOVA with BDI- and SPIN-scores as covariates was conducted to examine the difference in reported emotional *distress* and *mean negative emotions* between the two superordinate categories. No significant main effect of *superordinate categories* was found (*Wilks*λ 0.95; $F_{(2,62)}$ 1.82; $p=.171$; $\eta^2=0.055$). To examine the differences between the seven *subcategories* in reported *emotional distress* and the *mean negative emotions* as independent variables, one more MANCOVA was conducted. A significant main effect of *subcategories* (*Wilks*λ 0.68; $F_{(12,114)}$ 2.07; $p=.025$; $\eta^2=0.179$)

Table 2 Content of negative mental imagery in youths

Content of negative images	Frequency distribution n (%)	Levels of distress M (SD)	Levels of negative emotions M (SD)
Interpersonal threat	42 (52.5%)	8.12 (1.86)	4.77 (1.72)
Conflicts with friends/family (e.g. "*crying at my desk, reading an awful message from my boyfriend*")	17	8.82 (1.29)*	4.98 (1.97)
Loneliness (e.g. "*being alone, not being able to speak*")	7	7.86 (1.22)	4.85 (2.22)
Social embarrassment (e.g. "*pupils making fun of me, insulting me, laughing at me*)	11	8.64 (1.29)*	4.92 (1.12)
Failure in a performance situation (e.g. "*sitting in my final exams, forgot everything I've learned*")	7	5.86 (2.67)*	3.92 (1.35)
Physical threat	25 (31.25%)	8.36 (1.68)	4.31 (1.64)
Physical harm to another person (e.g. "*a friend of mine falls down the stairs at school, hearing his crying and falling sounds*")	9	8.73 (2.28)	5.09 (2.01)
Death of someone I care about (e.g. "*seeing my grandpa lying in a coffin*")	11	8.45 (1.13)*	3.95 (1.14)
Accidental/unintended physical injury of oneself (e.g. "*getting a door smashed into my face, feeling blood running down my face*")	5	7.67 (1.37)	3.67 (1.62)
No image	13 (16.25%)		

Note. Content of negative mental images in an adolescent sample ($n=80$) aged 14–20 and associated distress and *mean* of reported negative emotions. The numerical value of associated negative emotions is the calculated mean of levels of *anxiety, sadness, anger, disgust, shame* and feelings of *guilt*. * Significant differences in a MANCOVA with depression- and social anxiety scores as covariates (*Wilks*λ 0.68; $F_{(12,114)}$ 2.07; $p=.025$; $\eta^2=0.179$)

was discovered for *distress* and *negative emotions*. This main effect could be traced back specifically to significant differences in the dependent variable *distress* ($F_{(6, 66)}$ 2.83; $p=.017$; $\eta^2=0.223$) between *failure in a performance situation* and each of the following: *conflicts with friends/family* ($M_{difference}$ 2.97, *SE* 0.74; $p=.003$); *social embarrassment* ($M_{difference}$ 2.78, *SE 0.79*; $p=.018$) and *death of someone I care about* ($M_{difference}$ 2.60, *SE* 0.79; $p=.037$).

Characteristics In order to investigate the differences in *emotional distress* and *mean of negative emotions* between the different *perspectives* (independent variable), we conducted a MANCOVA with BDI- and SPIN-scores as covariates. No significant main effect of *perspective* (Wilksλ 0.93; $F_{(4,124)}$ 1.21; $p=.312$; $\eta^2=0.037$) was found. To examine the differences in reported *anxiety* (as dependent variable) between types of *perspective* (as independent variables), we conducted an ANCOVA with BDI- and SPIN-scores as covariates. A significant main effect of *perspective* was found for *anxiety* ($F_{(2,63)}$ 4.07; $p=.022$; $\eta^2=0.114$). Bonferroni-corrected post-hoc-tests showed significant differences between *observer perspective* and a *combination of both perspectives* ($M_{difference}$ 3.03, *SE* 1.01; $p=.011$). Higher levels of anxiety were reported when perceiving an image in a *combination of both perspectives (M=7.47, SD=2.60)* compared to *observer perspective (M=4.44, SD=2.19)*. To investigate the link between *frequency, vividness and controllability* with *emotional distress* and associated *anxiety, sadness, anger, disgust, shame* and feelings of *guilt*, a correlational analysis with BDI- and SPIN-scores as covariates were conducted. Table 3 shows the significant correlations.

A higher frequency was therefore associated with higher levels of *distress*, *anxiety*, *sadness*, *guilt, shame* and *anger*. Experiencing a negative image as more vivid was associated with a higher score for *emotional distress*, *anxiety, sadness, anger, guilt, disgust* and *shame*. Less control over negative images is associated with higher levels of *distress*, *anxiety*, *sadness*, *guilt, anger* and *shame*.

Table 3 Significant correlations between characteristics of negative MI and associated emotions

	Frequency		Vividness		Controllability	
	r	p	r	p	r	p
Emotional Distress	0.66	0.001*	0.82	0.001*	−0.53	0.001*
Emotions						
anxiety	0.69	0.001*	0.69	0.001*	−0.53	0.001*
sadness	0.48	0.001*	0.59	0.001*	−0.44	0.001*
anger	0.34	0.002	0.52	0.001*	−0.31	0.006
disgust			0.38	0.001		
guilt	0.48	0.001*	0.41	0.001*	−0.30	0.008
shame	0.41	0.001*	0.32	0.004	−0.25	0.027

Note. Significant correlations from a partial correlation analysis with BDI-II and SPIN-scores as covariates in an adolescent sample aged 14–20 years. Only significant correlations are reported. MI=Mental imagery; BDI-II=Beck Depression Inventory. SPIN=Social Phobia Inventory. *$p \leq .001$

Discussion

The aim of this study was to identify content of spontaneous positive and negative MI in adolescents, and to investigate content and characteristics of MI and their link to associated emotions and distress. The qualitative analysis revealed two superordinate categories for positive images (*social reward* and *physical reward)* and two superordinate categories for negative images (*physical threat* and *interpersonal threat).* Five categories for positive images (social reward: *enjoying time with family or friends, romantic situations;* physical reward: *enjoying nature, practicing sports*) and seven categories for negative images (interpersonal threat: *conflicts with friends/family, death of a close relative, loneliness, failure in a performance situation, social embarrassment;* physical threat: *unintended/accidental physical injury of oneself; physical harm of another person*) were identified.

Participants reported positive and negative images significantly more often about social themes. One explanation could be that puberty is a phase in which acceptance of one's preferred peer group is more important than in other phases (Blakemore & Choudhury, 2006; Lynn Mulvey et al., 2017; Sebastian et al., 2011). Our findings support this hypothesis, as it seems that social situations during this phase are particularly popular. The study also confirms the relevance of social contacts for young people. Therefore, adolescence should be given the opportunity to have many positive social experiences, whether at school or in their free time. In therapy of anxiety disorders, for instance, patients are advised to imagine a safe-place or situation in which to relax (Williams & Poijula, 2016). For adolescence, it might be more suitable and easier to imagine a pleasant social situation.

Furthermore, images about practicing sport or enjoying nature were also reported as positive images. Our finding indicates that engaging in sport is considered as pleasant, even when only thinking about oneself doing so. Success and achievements in school, as well as praise from teachers or parents were not mentioned. This might indicate for teachers and parents, that positive reinforcement should be more often part of every educational method.

We additionally expected a difference in emotional distress and associated emotions between contents for positive and for negative MI. Significant differences were found for associated distress, but not for associated negative emotions. Participants who report having images about *failure in a performance situation* also report low levels of distress. *Conflicts with family or friends, physical harm of another person* and *social embarrassment* are themes which were associated with higher levels for distress than performance in school. The low level of emotional distress might be an explanation for motivational problems in school among adolescence (Rosenbaum, 1991). For positive images, we did not find such differences in associated joy, neither between superordinate nor sub-categories. It seems to be less important what a positive mental image is about, as long as the image is vivid, frequent and controllable.

Furthermore, we investigated the link between various characteristics of MI and the associated emotions. Regarding the use of perspective, we assumed a higher level of joy for field-perspective. As no significant differences in reported joy occurred between the perspective options in positive images, this hypothesis was not confirmed by our results. Maybe the effect was too small to be revealed with such a

small number of participants. Furthermore, we hypothesized that adolescents reporting a frequent use of field perspective in negative images would also report a higher score for anxiety. Perceiving an image from a combination of both perspectives was associated with higher levels of anxiety than experiencing an image from an observer perspective only. This partially supports previous findings, indicating that field perspective is associated with higher levels of emotions and distress (Holmes et al., 2008; Vella & Moulds, 2013; Williams & Moulds, 2007), as those studies did not ask for the combination of both perspectives. We assumed that participants who experience images from an observer perspective report lower levels of anxiety, as this perspective is typically used by patients with SAD (e.g., Schreiber & Steil, 2013) or PTSD (e.g., McIsaac & Eich, 2004), and they tend to avoid anxiety. Our finding supports the assumption that the use of the observer perspective is part of an avoidance technique (Kenny & Bryant, 2007) and thus needs to be noted and prevented by therapists, for example while using exposition in sensu. Investigating the use of the combination of field- and observer perspective and its association with emotions in an experimental design is indispensable as our study is the first asking for the use of a combination of perspectives.

Regarding frequency, more frequent positive MI was linked to a higher score of joy (moderate correlations), which supports to encourage adolescence to have positive mental images often. More frequent negative images were linked to higher distress and higher negative emotions, especially anxiety. Therefore, a habituation effect does not seem to exist in this sample.

Furthermore, we assumed that the vividness of positive and negative MI correlates positively with higher levels of emotional distress and the associated emotions. This statement can be confirmed, as higher vividness was linked to a higher score for *joy* (high correlation*)*. Trying to imagine a positive image in each sensory modality seems to be important to increase joy and should be encouraged by therapists when using positive MI e.g. in relaxation exercises. For negative images, we found significant high correlations between vividness and reported distress, anxiety, sadness and anger. Vividness seems to be an important factor mediating the effect of MI on emotions, and therefore needs to be considered when dealing with MI in both the research and therapy contexts.

Regarding the effect of controllability, we found a large positive correlation between controllability and joy in positive images. Having control over the image seems to be good in positive images, as a higher score of joy was associated. In negative images, we found large negative correlations between controllability and distress and anxiety. Therefore, a training to increase control over MI might be useful in order to increase mental health as positive emotions might occur more often and more intense. Such a training might consequently help to prevent the development of mental disorders and also to treat these disorders. Techniques which probably improve control over MI in children and adolescents include imagery rescripting, emotive imagery, imagery-rehearsal therapy (for detailed review of these techniques see Schwarz et al., 2020). To what extent these methods lead to increased control still needs to be examined.

Limitations

This study has several limitations. First, the sample size is rather small, especially for investigating so many different contents of MI. While the interview has been widely used in adults and has shown to be a valid instrument, the validity of our measure for youths is questionable and complicate the potential for generalization. A validation of the MIQ-Y could also not be done due to the small sample size. The group size for each individual content is particularly small and generalization is therefore limited. Furthermore, nothing can be said about the causality of the relationship between emotions and characteristics of mental images, as we used a cross-sectional design in this study. Although many participants (one-fifth of the sample) have a high score in the depression and social anxiety questionnaire, there is only limited applicability and generalizability of any conclusions drawn to clinical samples, as there were no external clinical assessments and no detailed diagnostic face-to-face interviews (and therefore no diagnosis can be made), As we only used self-report measures there is a lack of verifiability of the objectivity.

Our sample has a relatively high social status and education, as more than one-third attend university. As most of the participants, which started the web-based design, dropped out after the MiQ-Y, the questions may have been too conceptual for some of the adolescents, explaining the high educational status of our final sample. The responses of the participants in this study, who completed the whole survey, did not indicate that they had trouble understanding any questions, although the MIQ-Y was developed based on a semi-structured interview (Hackmann et al., 2000) and not based on a questionnaire. Although we gathered pilot data, the use of questionnaires (and not face-to-face interviews) might not be suitable for measuring such a complicated and non-figurative construct, as mental imagery and questions may have been understood differently by respondents in terms of language (e.g., unsuitable wording, Campbell and Rapee, 1996) or lack of adequate reading ability (Vasey et al., 2003). Youths might have more problems reporting emotions, cognitions and other mental processes compared to adults, as they might have a less pronounced self-awareness. Furthermore, there are several limitations due to the fact that the data are from an online survey. Certain age and social groups are more likely to take part in such surveys. For example, participants with a lower level of education might not respond (Blasius & Brandt, 2009), which might be also an explanation for the high social status in our sample. We also cannot ensure that the information given on age or gender, for example, is true. To guarantee that a participant only completed the survey only one time, every IP-address only could participate once. However, we still cannot definitely ensure that participants completed the survey a second time. Furthermore, we could not control current mood or any kind of environmental emotional priming effects such as actual experience of e.g. a fight with friends, right before our survey. Because of its exploratory nature, this study could be a preliminary study to an experimental study where participants could be asked to generate a standardized mental image and then evaluate the emotions.

Conclusion

Despite these limitations, our study is among the first to identify themes of positive and negative MI and to investigate the association between themes *and* characteristics of MI *with* emotional distress and emotions in adolescents. Most adolescents reported having images about social themes and adolescents having images about social conflicts reported higher levels of emotional distress than adolescents having MI about failure in a performance situation. This indicates and emphasizes that adolescence is a phase in life where social contacts are especially important. To increase joy, positive MI should be vivid, frequent and controllable. Techniques which might lead to an increased control over MI need to be examined.

In negative images, a higher frequency and vividness as well as less control over negative images was associated with higher levels of especially emotional distress and anxiety and perceiving an image from a combination of both perspectives was associated with a higher score of anxiety. These characteristics should be considered by therapists while addressing MI and especially perspective should be kept in mind while using exposition in sensu. As this is the first study dealing with the combination of perspectives, the results raise questions about previous results comparing each perspective individually.

When working with adolescents in school, therapy or leisure, encouraging adolescents to use their imagination and to generate a vivid positive image and practice to gain control with suitable methods over positive and negative MI, may have a beneficial effect on associated emotions and may therefore also promote mental health. To ensure that these findings are indeed particularly relevant for adolescents, replications in adults and children are needed. Thus, replications with a larger sample size and clinical adolescent samples are needed, as well as longitudinal assessments of MI, to deal satisfactorily with causal issues. The present pilot study also creates an opening point for upcoming investigations of the association between content and characteristics of MI and emotions.

Data Availability Data and material are available upon reasonable request.

Code Availability Not applicable.

Declarations

Conflict of interest The authors have no current or potential conflict of interest to declare that may have a direct bearing on the subject matter of the article.

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