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„ The impact of children's body awareness on emotional recognition in dance "

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The impact of children's body awareness on emotional recognition in dance

Imagine the following situation: You are watching a film in which the main character is confronted with death, you see in his posture, his gestures, and his mimicry that he is grieving. Tears come to your eyes, your posture shrinks, and you hover and also begin to cry. You sympathize with him because you can relate to how he seems to be feeling. Emotions are embodied—meaning that they are stored and expressed throughout the body—therefore a multimodal construct (Aviezer et al., 2012; Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009). Based on the previous example, one can see that physical cues play an important role in emotional encoding. Supporting evidence suggests that body posture (Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009) and body expression (Aviezer et al., 2012) play an important role in the decoding of emotions, since emotions are embodied (Aviezer et al., 2012; Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009).

The discipline of dance is an illustrative example to show the embodiment of emotions. Dance as a dynamic form of movement is naturalistic and closer to real life context than static movements and is therefore often used in researching emotion recognition in bodily cues (Boone & Cunningham, 1998; Lagerlöf &Djerf, 2009). Studies with children aged 4-, 5-, and 8-year-olds showed that the ability to decode basic emotions such as fear, anger, happiness, and sadness from dance movements, is present at an early age and develops over the course of the pre-school years (Boone & Cunningham, 1998, Lagerlöf & Djerf, 2009). Furthermore, connections are detected between one's own body (one's body awareness), which includes the motor system, and one's ability to recognise certain cues that are necessary for the encoding of emotions (Boone & Cunningham, 1998). For instance, Boone and Cunningham (1998), found that happiness was more easily recognised when many upward-arm movements were present. This cue recognition performance was associated with the motor ability to perform the movement (Boone & Cunningham, 1998). Studies on anxiety and autism provide more evidence that impairments in body awareness may be a reason for low emotion sensitivity (Garfinkel, 2016), suggesting that children with a lower-body awareness might find it more difficult to identify the emotions transported through another's body language. These findings highlight the role of the own body in emotional recognition tasks.

In general, emotions serve to quickly respond to environmental changes (Rieffe et

al., 2008) and the ability to accurately encode emotions plays an essential role in social interaction and can thus be seen as a developmental task for children (Herba et al., 2006). Although there is a consensus that children can recognise emotions from faces from an early age (Leppänen & Nelson, 2009; Pons et al., 2004), there is disagreement concerning which emotion —anger, happiness, fear, or sadness will be recognised first (Pons et al., 2004). Furthermore, it is unclear whether this emotion recognition based on facial cues differs from emotion recognition based on bodily movements (Aviezer et al., 2012). One reason for this could be that research suggests that body and face are processed holistically (Aviezer et al., 2012), which further highlights the importance of the cues from the body for emotion recognition. Although the body seems to play an important role in decoding emotions, research on emotion recognition based on bodily expressions is scarce and experiments on emotional recognition are predominantly conducted with adults and studied based on faces (Herba et al., 2006).

Therefore, grounded on theories of embodied cognition, the aim of the current study was to investigate the role of the body in emotional perception in dance movements in children. The purpose is to gain knowledge about developmental aspects of emotion recognition, body awareness, and the interaction of these factors. The contribution is thus to increase theoretical knowledge as well as providing practical implications for clinical research, emotion, and perception research, which could also be extended to applied sciences.

Emotion recognition in faces & body

From the very first moment of life, children are confronted with different facial expressions, indicating that the development of the ability to interpret emotions in others is important and begins in early childhood (Leppänen & Nelson, 2009; Peltola et al., 2011). Research suggests that children can distinguish between fearful and happy faces as early as 7 months of age, as infants were found to show increased cardiac activity and significantly longer fixation times when confronted with fearful faces as opposed to happy faces (Peltola et al., 2011). This suggests that the ability to encode fear from faces commences prior to the development of recognizing happy faces (Peltola et al., 2011). However, other studies on emotion perception provide contradicting evidence on the order of the development to encode the different emotions. Kujawa et al. (2014)

found that the ability to recognize happiness in faces develops first, followed by other basic emotions (fear, anger, sadness). Nevertheless, these results also imply that the ability to recognise basic emotions in faces develops in early childhood.

Although there are divergent findings on the sequence of emotion perception development, research largely agrees that the ability to decode the basic emotions of anger, happiness, fear, and sadness develops before the ability to perceive more complex emotions (Tracy & Randles, 2011). Existing research also concurs that basic emotions are discrete, meaning that they consist of specific components, which are neurologically as well as physiologically expressed. Moreover, they have a specific motivational aspect and are associated with a feeling (Tracy and Randles, 2011). Furthermore, there is a consensus that they are primitive, meaning that they originate from specific brain regions, and they are minimally regulated—neither behaviourally nor cognitively (Tracy & Randles, 2011).

Since the ability to read emotions from faces develops in early childhood, the question arises at what point children can read emotions from body movements, since face and body occur together in the natural world and cannot be separated from each other (Aviezer et al., 2012). The sparse research on the role of the body in emotion recognition suggests that the body of others is used as a reference point in emotion recognition when incongruent information from body language and facial expression is presented—the emotion recognition becomes biased towards the emotion expressed in in the body (Meeren et al., 2005). In other words, the body serves as “anchor” in emotion decoding (Meeren et al., 2005). Further evidence shows that when processing bodily cues, presenting contradicting information from body and face results in an effect similar to the stroop-effect (Stroop, 1935), which is diminished when the head is presented disjointed from the body (Aviezer et al., 2012). These results convey that when bodily cues are used to identify emotions of others, body and face are processed holistically (Aviezer et al., 2012).

All the above-mentioned studies used static positions to investigate emotion recognition. In reality, emotions are expressed rather in movements than in static postures and there is evidence that children show preferences to movements rather than to static postures (Boone & Cunningham, 1998). The few studies that deal with emotions recognition in bodily cues in movement use dance as a dynamic form of movement as

an instrument to research the relation between emotion recognition and the expressed emotion in the movement. A reason to do this is that dance creates spontaneous, non-scripted movements, which are said to be more realistic than static movements in reflecting the emotional state of the person expressing the emotion (Boone & Cunningham, 1998; De Meijer, 1989). Evidence comes from studies with point-light-walkers, that showed that children prefer natural movements presented the right way up compared to movements presented the wrong way up. (Fox & McDaniel, 1982) and that children could identify movements of a point-light walker of moving people and animals but failed to identify people and animals in static images (Pavlova et al., 2001), which supports the theory that natural and dynamic movements are preferred to static images.

To the best of our knowledge, there are only a handful of studies in the field of emotion recognition of bodily movements in dance with pre-school children. Boone and Cunningham (1998) particularly addressed the role of bodily cues to decode emotions in dance by investigating the understanding of emotions in expressive dance movements in four, five, eight-year-old children, and adults. They carried out two different tasks: In the Emotional Intensity Task, they investigated which expressive cues participants orient to when the intensity of the emotion shown is varied—also called specific emotion recognition ability and conducted solely with the emotions of happiness or anger (Boone & Cunningham, 1998). Thereby they distinguished between the frequency of upward arm movement, which is used to recognise happiness, and the directional changes of torso and face, which is associated with the emotion anger (Boone & Cunningham, 1998). The upward arm movements and the directional changes were varied in intensity to find out how strongly these cues influence emotion recognition (Boone & Cunningham, 1998). In the Emotion Contrast Task, they gave a task to investigate the general ability of the children to recognise emotions in dance pieces (Boone & Cunningham, 1998). Participants were presented with two qualitatively different emotions and had to decide which performance was happy, sad, fearful, or angry (Boone & Cunningham, 1998). They found that 4-year-olds have the general ability to identify sadness, while 5-year-olds have the general ability to decode happiness, fear, and sadness (Boone & Cunningham, 1998). In addition, it was shown that children at the age of 5 were better at decoding anger in the Emotional Intensity Task when the frequency for

directions changes of torso and face was higher, indicating that the recognition of emotion is related to the intensity of the presentation of the emotion (Boone & Cunningham, 1998). Resulting from that it can be said that the ability to elicit emotions through movement improves with age. This was supported by the fact that 8-year-olds showed the same ability in the Emotions Contrary Task as in the Emotions Intensity Task, whereas younger age groups needed stronger emotional intensity cues to recognize emotions (Boone & Cunningham, 1998). Boone and Cunningham (1998) suggest that the differences in emotion intensity may be due to differences in motor development, which are related to the perceptual development. In addition, they suggest that the combination of these two categories of emotion intensity and the general ability to encode emotions is related to verbal development in naming emotions, which improves between 4-5 years of age, indicating that language and motor development play a role in the understanding/decoding of emotions in movements.

Lagerlöf and Djerf (2009) replicated the study by Boone and Cunningham (1998) with a study of children aged 4, 5 and 8 years old, and adults. They played the participants videos of eight different dance improvisations of the basic emotions of anger, happiness, fear, and sadness to investigate the general ability to recognise emotions in dance pieces (Lagerlöf & Djerf, 2009). Furthermore, they examined the cues used for successful emotion recognition by analysing the video recordings of the dancer according to the factors space, force, time, and flow (including changes in tempo or suddenness of movement) with a specialised computer programme (Lagerlöf and Djerf, 2009). In contrast to Boone and Cunningham (1998), they found that the 5-year-old children had the same recognition performance as the 8-year-old or adult group and that the 4-year-olds were inferior to the other groups (Lagerlöf & Djerf, 2009). All groups 4, 5, 8 years old, and adults achieved significant overall recognition performance of all basic emotions, suggesting that even 4-year-old children can recognise emotions from dance pieces (Lagerlöf & Djerf, 2009). Also, the video cue analysis showed that force and tempo are the decisive factors for successful emotion encoding (Lagerlöf & Djerf, 2009), illustrating that a certain understanding of body movements, which is necessary for emotion recognition, improves with age

Both studies assume, analogous to the basic emotions' hypothesis (Tracy & Randles, 2011), that certain cues in the structure of the movement are relevant in the

decoding of emotions (Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009). It was found that both upper-arm movement for happiness and rapid changes of direction in torso and face for anger are relevant cues (Boone & Cunningham, 1998). It is suggested that these cues can only be used to decode emotions if perceptual motor experiences with this movement (cue) exist (Boone & Cunningham, 1998), manifesting that the ability to recognise an emotion is related to the experience of having embodied that emotion before.

The role of the body in emotion processing

Embodiment theories address and thoroughly explain the role of the body in different processes by assuming that emotions are processed with both body and mind by simulating them in the own body. Therefore, the term embodiment is often used as a synonym for embodied simulation or simulation hypothesis (Barsalou et al.,2003; Niedenthal et al., 2014). The simulation hypothesis is supported by findings showing that participants give more false judgments of whether a smile is genuine or false when their own mimicry is blocked, and they can thus not simulate the smiles they see (Maringer et al., 2011). Further supporting evidence illustrates that the ability to discriminate facial expressions is significantly reduced when specific areas of the somatosensory cortex are disturbed by TMS impulses (Pitcher et al., 2008). Based on this finding, it can be said that the bodily cues and the sensorimotor system play an important role in emotion recognition in faces and posture. Assuming that emotions are a multimodal construct with both physiological and neurological components (Niedenthal, 2007), cues from the own body, movement, and posture should also play a role in the quality of the perceived emotion. Accordingly, personal body awareness plays a role in the ability to encode emotions from others.

Body awareness and its relation to emotion recognition

In the psychological field, body awareness is a broad concept, and the term is often used as a synonym for “interoception or interoceptive awareness” (Craig, 2020). It can also be referred to as “corporal awareness” (Braun et al., 2018; Simons et al., 2011). As evident from the differing terminology, body awareness is a construct that encompasses many facets. Within this study, body awareness was conceptualized as the

awareness of, and the attention to external and internal bodily signals as well as the capability to integrate knowledge of both, which is also referred to in research as corporal awareness or body perception (Simons et al., 2011).

In the field of body awareness, much of the research is concerned with the conceptualisation of body awareness as interoceptive awareness. Interoceptive awareness refers to the ability to accurately assess one's own bodily signals such as hunger, thirst, and arousal level (Buck, 2014). Research asserts that interoceptive awareness and emotion processing are related (Bushnell & Boudreau, 1993). Supporting evidence from clinical research on autism found low interoceptive awareness to be associated with poorer emotion recognition (Garfinkel et al., 2016). Furthermore, high interoceptive awareness could be related to better coherence between physical and subjective emotional systems, which, in turn, is also related to better emotional processing (Sze et al., 2010). These results point toward a relation between interoceptive awareness and emotional processing.

Assuming that there is a connection between interoceptive awareness and emotion recognition, the question arises whether other constructs that can be conceptualised as body awareness are also related to emotion recognition. Connections between the motor system (Boone & Cunningham,1998; Bushnell & Boudreau, 1993) also fall under the umbrella term of body awareness (Kugel, 1997, Simons et al.,2011), and emotion recognition have already been postulated. Supporting evidence from research with children aged four years, who failed to recognize emotions of anger and happiness in dance pieces, manifests that the ability to recognise emotions in bodily movements may not be present at the age of four years due to a lack of motor skills (Boone & Cunningham, 1998). Boone and Cunningham (1998) concur that the children aged four had fewer motor experiences and had thus not yet stored knowledge of certain emotion in the body (for more detail see Boone & Cunningham, 1998), indicating that the development of motor skills is related to other developmental aspects, especially the development of the ability to recognize emotions from bodily movements.

According to Kugel (1997), who referred to a similar definition of body awareness as the definition of Simons et al. (2011), sensory and motor structures indeed play an important role in the development of body awareness (Simons et al., 2011). The successful development of these sensory and motor structures is moreover trained through

experience (Simons et al., 2011; Slaughter & Heron, 2004). Experiences and the successful sensory integration of these sensory inputs can be made in interaction with others (Kugel, 1997). Moreover, it can be said that motor development improves with age as more sensory experiences are gained and integrated (Cech & Martin, 2013). Imitation of motor action plays also a role in these motor/sensory experiences because imitation offers the opportunity to imitate motor movements of others in a safe setting and thereby to gain experience (Buck, 2014). In other words, “I do what you do because it works for you”, signalling that imitation and body awareness are interrelated. On the one hand, imitation serves to enter social interaction and to learn through a social context (Buck, 2014). On the other hand, it requires knowledge about one's own body to be able to imitate facial expressions and gestures (Gopnik & Meltzoff, 1994). In imitation knowledge about one's own body, localization in space and the ability to control motor skills, as well as the ability to differentiate between the own body and another body plays a role (Cech & Martin, 2013; Gopnik & Meltzoff, 1994). The coupling of movement and perception by differentiating between the own body and the body of other’s, is important in imitation and plays a crucial role in the development of the perception of the surroundings, which also includes emotions seen in others (Cech & Martin, 2013). Therefore, it could be seen as one important link between body awareness and perception. There is little research on specific body awareness skills in kindergarten age, but research with younger children show that 11-month-old infants recognize moving images of themselves sooner than the static version of themselves, indicating that children move purposefully to gain proprioceptive information to develop body awareness (Bigelow, 1981). Moreover, a study with infants shows that mistakes in a task designed to measure body-self-awareness decrease with rising age of the infants (Brownell et al., 2007). Assuming that body-self-awareness is intertwined with sensory-motor system and the development of body awareness, it can be said that body awareness becomes more elaborate with age (Bigelow, 1981; Cech & Martin, 2013). Based on the fact that body awareness improves in young children and the indication that motor development is not yet complete in early childhood (Bushnell & Boudreau, 1993), the hypothesis arises that the development of body awareness is not ended in infant age and refines over the pre-school years.

Present study

In summary, there is evidence that bodily cues from others' play a crucial role in the encoding of emotions in children. However, there are deviating results on the order and age at which the ability to recognise different emotions based on physical cues develops. One possible explanation for the controversies regarding the sequence at which emotions develop, could be individual differences—the factor body awareness could be one of these explanatory factors. Body awareness has hardly been investigated in the context of emotion recognition in bodily movements or was often conceptualized as interoceptive awareness (Craig, 2020; Garfinkel, 2016). Evidence suggests that motor development is related to the perception development, which includes emotion decoding (Boone & Cunningham, 1998; Bushnell & Boudreau, 1993). As there is also evidence that the motor system and the ability to imitate (Buck, 2014; Cech & Martin, 2013) play an important role in the development of body awareness, and that body awareness is related to emotion recognition, this study is interested in investigating motorically and imitational aspects of body awareness in form of an imitation test in relation to the ability to recognize emotions in dance. To shed light on the deviating findings of the age at which the ability to recognize emotions develops, this study consciously did not examine children aged 4, 5 and 8 years as Boone and Cunningham (1998), Lagerlöf and Djerf (2009) did, but instead children aged 3, 4, and 5 years. Research asserts that children are able to recognise emotions from body postures (Nelson & Russell, 2011) or facial expressions (Pons et al., 2004) at the age of three years, and that the ability to recognize emotions is almost as well developed as the ability to detect emotions from faces (Nelson & Russell, 2011). To investigate whether the ability to recognise emotions from postures or facial expressions is also transferable to emotions expressed in movements, children as young as three years old were integrated in the present study.

The main aim of the present study was to clarify the relationship between body awareness, age, and emotion recognition in bodily movements. Based on previously presented research, the following research question arose: How does body awareness and age of pre-school children affect their ability to decode emotions in dynamic movements? Based on the previous research question, the hypotheses are as follows:

H1: Higher body awareness and older age are predictors for better emotion recognition in dance.

H2: Older children have better body awareness compared to younger peers

Methods

Participants

The sample consisted of overall *N* = 34 children (15 female and 19 male). For the analysis of *H1*, four participants had to be excluded because there were no recordings of the imitated gestures. This resulted for the *H1* in a sample of *N* = 30 children (14 female and 16 males; age *M* = 48 months, 0 days with a *min* = 36 month; *max* = 71 months; *SD* = 10.63 months)3 male and 13 female; age *M* = 49 months, 0 days with a *min* = 36 month; *max* = 71 months; *SD* = 2.17 months).

The overall sample was characterized by high education: 32 of 34 parents reported at least one parent to have an academic profession. Most of the parents (33 from 34) reported German to be the language mainly spoken at home. Although, one parent stated Italian to be the language mainly spoken at home. None of the respondents reported significant prior dance experience.

All participants were recruited from the database of the Department of Developmental Psychology (Wiener Kinderstudien, University of Vienna). Parents with children in the appropriate age were contacted by phone and were informed about the aims and procedures of the study and asked to participate. Parents showing interest in the study were sent an e-mail with details and a link to fill out the informed consent. Subsequently, they gave informed consent to the participation in the study and data protection declaration, they received an automatically generated e-mail with the log-in data to the study. The participants received no financial compensation for their participation, but the parents received an e-mail with a personalised certificate for their child for the participation in the study.

Procedure

The study design was a with-in-subject design with repeated-measures in format of an online-study on the platform *labvanced* (Finger et al., 2017). At the beginning, the parents were instructed to set up their devices, received information about the duration of the study, and were instructed how to interact with their children in order to minimally influence the answers and behaviours of their children during the time of the experiment. Overall, the study participation lasted about 30 minutes (including the time of

the questionnaires). After the instruction and the set-up, the parents had to answer questions about their socioeconomic background, prior dance experience, and 10 questions to the body awareness of their children from a shortened, abridged and translated version of the original SPM (Parham et al., 2007). Finally, parents were instructed to call for their child and to place it one meter away from the screen in order to ensure an appropriate image section for the video recordings of the hand and finger gestures. An audio sample to adjust the volume for the audio instructions for the child had been played and the study with the child was started.

To slowly introduce the child to the study and create a familiar environment for testing, the child was, through a video recording, introduced to the person speaking in the audio instructions, which was also the same person performing the gestures later (a female 25-year-old psychology student)

Following, the screening-task for the recognition of the basic emotions ensured that the children had knowledge about the basic emotions anger, happiness, fear, and sadness. For this, the children were shown a selection of four comic-like pictures (see *Figure 1*) validated in other studies (Esposito & Serio, 2007). An embedded audio recording asked the participants about the respective emotion and introduced them to choose the appropriate emotion from the four pictures. The screening task had been followed by a "resolution" to ensure that the children understood which picture represents which emotion.

Figure 1

Illustration of the pictures used in the emotion screening task

Note. Emotions shown from left to right (1) fear; (2) happiness; (3) anger; (4) sadness

In the main emotion recognition task, the ability to recognize emotions was assessed by means of four stimulus videos (see *Figure 2*), in which a professional dancer presented the basic emotions of anger, happiness, fear, and sadness in a 60-second-long video recording. The video had no sound to prevent confounding factors, and the face of the dancer was neutral. The videos were presented separately in a randomized order to the children. After each video, the children were asked how the dancer felt in the last video and they were shown the four comic pictures (Esposito & Serio, 2007) from which they had to choose the appropriate emotion.

Figure 2

Image series of the stimulus videos

Note. Emotions shown from left to right: fear, happiness, sadness, anger

To investigate the connection, an adapted version (Vaivré-Douret & Lalanne, 2020) of the *Imitation of Gestures Test* (Bergès–Lézine, 1984) was used. In this measure, children had to imitate 16 fingers, and 10 hand gestures, all of which are embedded in a video recording of one researcher (for the detailed template used to create the videos, see *Appendix A*).

The participants were shown the video with the instruction “Can you do that”, asking them to imitate the following gesture. The gestures were shown starting with the 16 finger gestures followed by the 10 hand gestures. At the end of each gesture, a still image of the gesture was shown., so the child could see the gesture still when the video of the gesture ended. After they had seen the gesture in the video, the children were asked

"Can you do this". Meanwhile, 40 seconds of video recording of the participant started where the children ought to imitate the respective gesture. The video recording was later coded according to a specific coding scheme (for more detail see measurements). The parents also completed an edited and shortened version of the *SPM* (Parham et al., 2007), where they answered questions about the behaviour of their child to investigate body awareness from an external observer.

At the end of the study, the children were thanked through an audio recording. In addition to the data from the children, parents were asked questions at the beginning of the study about their socioeconomic background and prior dance experience.

Measures

Screening-Task

In order to test the children's understanding of emotions, four comic-like pictures depicting the basic emotions of anger, joy, fear and sadness were used. The selected pictures have already been used in a study of Esposito and Serio (2007) on emotion recognition in music in childhood and were also validated on a sample of N= 40 children.

Emotion recognition

A professional dancer was used for the stimulus videos to assess emotion recognition of anger, fear, happiness, sadness. She was interviewed about the meaning of the emotions fear, anger, happiness, and sadness. Afterwards, she was instructed to improvise these emotions in dance movements. For the children to perceive the videos as more natural, it was decided not to blur the face of the dancer and just instruct here to be as natural as possible. In a pilot study with two children (four and five years), in which the stimuli and the basic procedure were tested, the reason for the given answer was also asked in order to exclude the face as a decoding source for emotional recognition. Both children named body movements as the source of information for their response behaviour, which suggests that the facial expression had no influence on their response behaviour. To keep the distraction in the video as low as possible, the background in the video was as neutral as possible (black curtain on a stage). The duration of the videos was for the individual emotions: Anger (45 sec.), happiness (45 sec.), fear (45 sec.) and sadness (1.09 min.) For each video, the emotions (anger, happiness, fear, sadness), they were asked separately in

forced-choice format with four possible response alternatives from the stimulus set of Esposito & Serio (2007) The chosen answer could be either correct (=1) or incorrect (=0). To calculate the emotion recognition in the statistical analysis, a sum score was formed from all four videos with a minimum of 0 (no emotion was recognised correctly) and a maximum of 4 (all emotions were recognised correctly). The videos were validated with the same tasks in a separated study for adults with $N = 28$. The correspondence between the rated emotions in the adult study was high: 27 out of 28 participants out of the validation study made no mistakes in recognizing the emotions displayed in the video. Moreover, the basic procedure and the stimuli were tested in a pilot study with two children (four years and five years of age). Both children mentioned the body as an informational source for their answers. Therefore, it could be assumed that the dancer's facial expression did not significantly affect the judgement of the emotion.

Body Awareness

Operationalization of Body Awareness (Self-Assessment). Body awareness was assessed by means of coded videos from the participants imitating hand and finger gestures. Therefore, the gestures from the adapted version (Vaivé-Douret & Lalanne, 2020) of the *Imitation of Gestures test* (Bergès–Lézine, 1953) were presented by a 25-year-old psychology student. Each video was about 5 seconds long and had an audio with the words "look, can you do this?" (Translated from the original video "Schau, kannst du das?"). The videos were later coded by the researcher herself according to the following (0= could not imitate the gesture; 0.5 = imitated the gesture step by step; 1 = imitated the gesture correctly and in one go). As part of the objective assessment of the videos, additional coding rules were developed to minimise inconsistencies between raters and create uniform coding schemes (see *Appendix E*). Additionally, two researchers coded a part of the videos separately in order to ensure, that the ratings were objective. The Interrater reliability calculated using Cohen's-kappa for 17 participants assessed was ($\kappa = .788$; $p < .001$). Every gesture was scored separately, and a higher score corresponded to higher body awareness. A sum score of all videos was formed with possible a minimal value of 0 and a maximum value of 26. For the statistical analysis, a percentage of the achieved points of all assessable videos is calculated. This resulted as follows: If there are less than

26 videos, e.g., only 8 videos due to errors on the user side this value (8) is taken as 100%, and the points achieved in the remaining videos are set in relation to this reduced value as a percentage. This procedure allows for fewer videos, comparability between subjects, and counteracts data loss.

Data-exclusion criteria. In certain cases, individual videos of the hand or finger gestures had to be excluded. This was either the case when parents assisted the child with the hand or finger gesture by manually intervening in the study process or when videos could not be analysed due to poor visual visibility (camera resolution or poorly adjusted image section). Specific coding rules for the individual hand and finger gestures can be seen in *Appendix E*

External Assessment of Body Awareness. To also get an external measure of the child's body awareness an abridged and translated version of the original *Sensory Processing Measure* (SPM; Parham et al., 2007) is used.

The SPM consists of several scales, which serve to detect abnormalities or issues in the sensory processing in Kindergarten or pre-school children (Parham et al., 2007). For this study a shortened version of the sub-scale body awareness is used, abridged and translated in German.

*Item Example of Item 46: " Macht ihr Kind folgendes? Gegenstände (z.B. Bleistift oder Löffel) so fest greifen, dass es schwierig wird den Gegenstand zu benutzen? "*The response options were as following: "never"," sometimes"," often ", „all the time", whereby never gets a value of "1"; sometimes gets a value of "2"; often gets a value of "3"; all the time gets a value of "4". Overall, the answers could take on values between a minimum of 10 and a maximum of 40, whereby higher Scores correspond to problems in body awareness, indicating that the children have lower body awareness. For the statistical analysis values of this scale were summed up and a correlational analysis with the hand-and finger gestures score was calculated.

Statistical analysis.

For all statistical Analysis the software *R (R Core team, 2021) was used.

Results

Descriptive statistics

The descriptive statistics of the main variables: emotion recognition, body awareness, and age are reported with means, standard deviations, minimum, maximum as well as intercorrelations with confidence intervals in Table 1. The frequencies of the selected emotions of the variable emotion recognition are shown in figure 3.

Table 1

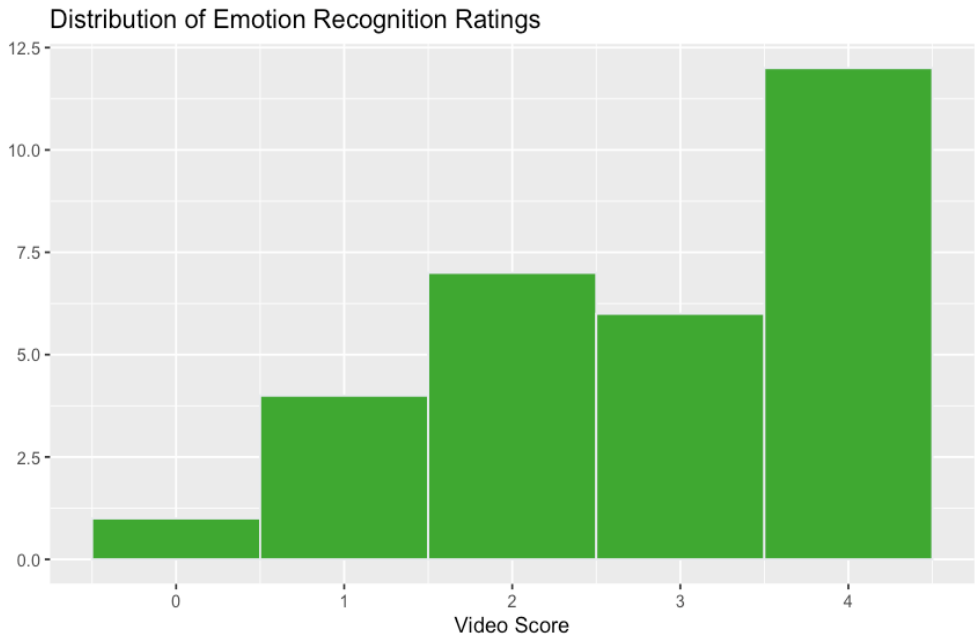
Descriptive statistics of main variables and correlations with confidence intervals

Variable	*M*	*SD*	Min.	Max.	1	2
1. Body_Awareness in percentage	54.83	16.39	12.00	78.26		
2. Age in month	48.03	10.63	36.00	71.00	.57** [.26, .77]	
3. Emotion_Recognition	2.80	1.21	0	4	.30 [-.06, .60]	.44* [.09, .69]

Note. M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2013). * indicates $p < .05$. ** indicates $p < .01$.

Figure 3

Frequencies of the selected emotions



Note. On the x-axis video scores are shown, on the y-axis relative frequencies are shown

Preliminary Analysis

To check whether there is a difference in emotion recognition between the different videos, anger, happiness, fear, and sadness, the Friedmann's rank sum test was used for the emotion recognition data (N = 34). A value of $p > .05$ means that it can be assumed that the location parameters are equally distributed. Friedman's test showed with (X^2 (3) = 7. 36, p = .061), that there was no difference in emotion recognition between the different videos. Based on the result of Friedman's test, a sum score can be used to calculate emotion recognition of the videos for the main analysis.

Analysis of main hypotheses

Based on previous research, positive correlations between body awareness and emotion recognition was assumed (H1). Therefore, a multiple linear regression was calculated. Body awareness and age were included as predictors in the model.

Model assumptions multiple linear regression. To calculate a multiple linear regression, the following requirements must be met (Field et al., 2012). The residuals in the model should not be autocorrelated (Field et al., 2012). The Durban-Watson statistic showed no autocorrelation of the residuals (p = .052). In addition, there must be no

multicollinearity (Field et al., 2012). This is considered to be fulfilled if the VIF factor < 10 (Bowerman & O'Connell, 1990);

The VIF factor in the model yielded a value of ~ 1.49 for the predictors body awareness and age in months. There must also be homoscedasticity of the residuals (Field et al., 2012)., which was confirmed by the Q-Q plot. A normal distribution of the residuals was checked by the Shapiro-Wilk test and can be assumed with W =. 95; *p* = .166. Outliers were checked using the Cook distance. Substantial outliers are data points with a value > 1 (Cook & Weisberg, 1982). No outliers could be found in this model. The relation between the variables has to be linear. This was checked with a scatter plot and the assumption is considered to be met.

H1: Higher body awareness and older age predicts the ability to recognise emotions in the dance. To test H1 a multiple linear regression was calculated. The results of the multiple linear regression with the factors *age* and *body awareness* are reported below in Table 2. This resulted in a marginally not significant value for the overall model. (R^2=.137; F (2) = 3.304, *p* = .0525.), indicating that neither *body awareness* nor *age* can explain a significant proportion of emotion recognition.

Table 2

Results of multiple regression with the predictors age and body awareness

Coefficients	B	*ß*	*SD*	*95% CI*	t	*p*
(Intercept)	.318		.989	[-1.71, 2.35]	.321	.750
Body awareness	.006	.079	.015	[-.026, .037]	.378	.708
Age	.0450	.393	.0242	[-.004,.094]	1.872	.072

Residual standard error: 1.129 on 27 degrees of freedom
Multiple R-squared: .1966, Adjusted R-squared: **.**1371
F-statistic: 3.304 on 2 and 27 DF, p = **.**05207

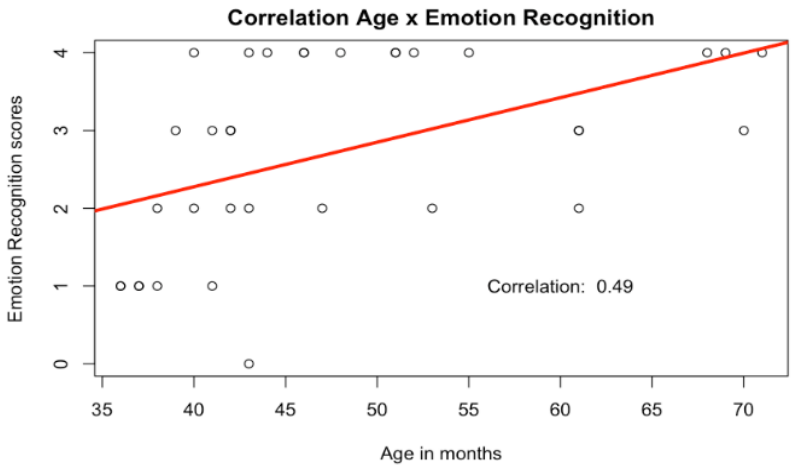
Note. the data for the linear regression was conducted with data of *N* = 30

Correlation of the factor age and emotion recognition. Because the missing values (missing video recordings of the body awareness measures) were excluded from the overall model this resulted in less data to investigate the relation between age and emotion recognition. To counteract loss of information, a correlation between the variable age and the variable emotion recognition was calculated separately that allowed data of four more participants to be included. The Pearson correlation coefficient was used to calculate this relationship between age and emotion recognition. This resulted in a positive significant correlation for $N = 34$ between age and emotion recognition in the videos with ($r = .491$; $p = .003$) with an effect size of Cohen's d ($d = .683$). According to Cohen (1988), the correlation coefficient $r = .4912$ corresponds to a moderate to strong correlation with a moderate effect.

The relationship between the two variables is shown in *Figure 4.*

Figure 4

Graphic of Correlation of Age and Emotion Recognition



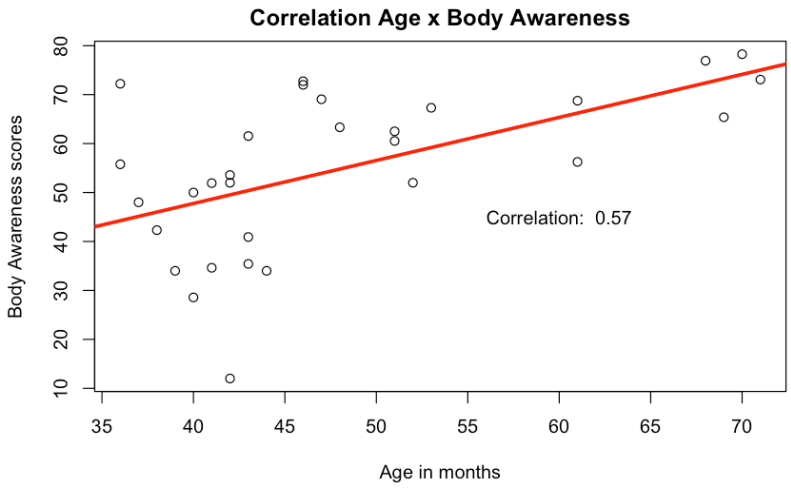
Note. The red line illustrates correlation between emotion recognition and age

H2: Older children have more body awareness compared to younger peers. The Pearson correlation coefficient was also used to calculate the correlation between body awareness and age. This resulted in a positive correlation for $N = 30$ between age and body awareness ($r = .575$; $p = .000$) with a Cohen's d ($d = .55$). According to Cohen (1988), the

correlation coefficient r = .5705 corresponds to a strong correlation with a moderate effect. The relationship between the variables is shown in *Figure 5*.

Figure 5

Graphic of correlation of Body Awareness and Age



Note. The red line illustrates correlation between body awareness and age

Exploratory Analysis of the SPM Data and Finger and Hand Gestures. Due to data collection delays and technical problems, only data from N = 16 persons were available for the *SPM*, and three out of these persons had no video recordings of the hand and finger gestures. A correlation between the External Assessment of Body Awareness by the SPM and the hand and finger gestures could only be calculated exploratively for the resulting N= 13. Due to the small amount of data and the probability of violation of normal distribution, the Spearman Rank Correlation was used to calculate the correlation. This resulted in no significant correlation between the two assessments of body awareness (ϱ = -.144, p = .6387), which according to Cohen (1988) corresponds to a small negative correlation.

Exploratory Analysis of the Distribution of Gender in the Age Groups. When reviewing the data, and through the recruitment process, it was noticeable that

particularly many male subjects belonged to the youngest age group, and particularly many older subjects were female. To check whether the gender distribution was normal and to evaluate gender to be a confounding factor with age, a Shapiro-Wilk test was calculated to check the distribution assumptions of the data. The normal distribution assumption can be confirmed if $p > .05$ (Field et al., 2012). A Shapiro-Wilk test was conducted separately on the distribution of females per age group and males per age group. This resulted in a value of $p = .001$ for the male subjects and a value of $p = .096$ for the female subjects in the Shapiro-Wilk test. Due to the violated distribution assumption, the data of the female subjects were re-analysed with the data of the male subjects according to age group using the Wilcoxon test, which resulted in a value of $p = .008$. This suggests that the genders within the different age groups are unequal and not normally distributed.

Discussion

The question on what influence the body plays in the observation, evaluation, and recognition of emotions is a widely researched topic. However, so far, no clear results have been found to answer this question fully, especially, with regard to emotion recognition in preschool children. This study aimed to contribute to answering this question by examining, based on theories of embodiment, to what extent one's own body awareness plays a role in observing and recognising the emotions of others. In addition, the study aimed to investigate age differences in body awareness and recognition of emotions through body movement to gain comprehensive knowledge on emotion development and the development of body awareness in childhood. Acknowledging previous studies with clinical samples that found a relation between low interoceptive awareness and problems in emotion recognition (Garfinkel et al., 2016), it was hypothesised that there is a positive relation of higher body awareness and emotion recognition in a normal sample in preschool children. In this study, body awareness was investigated using imitations of finger and hand gestures, since existing research emphasises the role of the sensorimotor system in the development of body awareness (Boone & Cunningham, 1998).

Against the expectation, higher body awareness was nonrelated to a better score in emotion recognition in the videos. This result joins the existing deviating findings on the role of body awareness in emotion recognition (Garfinkel et al., 2016). Garfinkel et al. (2016) found, in a study with a group of autistic individuals on the one the hand that interoceptive awareness, was negatively related to emotion recognition, whereas interoceptive sensitivity was positively related to emotion recognition. Interoceptive awareness can be seen as the ability to listen to bodily signals and control bodily processes (including motor activity), whereas interoceptive sensitivity can be referred to as a belief system of signals coming from the body (Garfinkel et al., 2016).These results imply that certain bodily signals, such as the heartbeat, could be perceived exaggeratedly strong whereas certain bodily needs, such as hunger or thirst, or the ability to control motor signals voluntarily, could be at impaired (Garfinkel et al., 2016). Both interoceptive awareness and interoceptive sensitivity fall broadly under the umbrella term of body awareness, and both have differing connections to the ability to recognise emotions, illustrating that body awareness is a multidimensional construct. Moreover, research indicates that motivational aspects (Braun et al., 2018) and attention (Salvato et

al., 2017) also plays a role in body awareness, indicating that motivational or attentional aspects could also have contributed to the present results. Supporting evidence from previous research showed a relation between body awareness, body-related stimuli, and the way these body-related stimuli are processed. More body awareness predicted the extent of memory-based-attention to these bodily stimuli, indicating a relation between body awareness and visual-spatial attention (Salvato et al., 2017). For this study, this could mean that body awareness and visual perception influence each other bidirectionally and work together, which means that not only the factor body awareness explains the results.

Moreover, derived from previous research, it is known that body awareness has different levels and can be divided into Sense of Agency and Sense of Ownership (Braun et al., 2018). Sense of ownership means the feeling of belonging to one's own thoughts, feelings and body parts., whereas the Sense of Agency is the experience of starting and controlling (motor)actions (Braun et al., 2018). The starting and controlling of these actions also involves the intention to move (Braun et al., 2018). In other words, body awareness also encompasses the will and/or motivation to move. For this study, it cannot be ruled out that this inherent will was present for all children during the study time, as it was noticeable when coding the videos that especially for the last gestures, which were easier than the first ones, the children often said that they would not be able to perform the gestures. As the last gestures were easier compared to the first ones, this indicates that a lack of motivation may have been the reason for the lack of execution of the gesture rather than the lack of ability to perform the gestures. The statement on the importance of motivation as a contributory factor in the performance of the hand gesture is supported by the fact that no correlation was found between the Body Awareness self-measures (hand and finger gestures) and the external assessment measure by the SPM (Parham et al., 2007). However, a slight negative trend in the expected direction was found, implying a relation in the expected direction as the scale of the SPM (Parham et al., 2007) is inverted. Considering the small sample size for the SPM (Parham et al., 2007) with $N = 14$, the correlation between SPM (Parham et al., 2007) and hand gestures could indicate that certain individual differences such as motivation or attention could have influenced the results, especially due to the construction of the study as an online study, which made it harder to monitor motivational aspects, as no researcher

was present during the time of the study. Overall, the results can only be seen exploratively, as the data set with the questions of the SPM (Parham et al.,2007) only amounts to $N = 14$ was very small. Overall, these results require further investigation to enable conclusions about the relationship between these two body awareness measures.

In addition, the unequal distribution of gender and age implies that part of the significant results of the *H2*, which postulated that age is a predictor for better emotion recognition rates is confounded with the variable gender, indicating that gender could also be the explaining factor for the better recognition rates. In this sample, many older children were female, and many younger children were male, which made it difficult to discriminate between age and gender as explanatory factors for better emotion recognition. Previous research on gender effects, which is line with the previous results, supports the fact that gender could have had an impact on the emotion recognition rates (Alaerts et al, 2011). Alaerts et al. (2011) showed that adult females are better in emotion recognition tasks of facial cues as well as in emotion recognition of bodily signals, which indicates that there are biological differences in emotion processing (Alaerts et al., 2011). Due to the confounding of gender with age, this result can only be classified into the existing theory on gender effects to a limited extent and must be examined more closely in future research.

In addition, the marginal significant findings on the relation of body awareness and emotion recognition can be at least partly explained by the low overall variance of emotion recognition and the small number of participants. In the emotion recognition task, a ceiling effect could be seen, indicating that nearly all participants could recognize all emotions (for distribution see *Figure 3*). This finding on emotion recognition sheds light on the development on the ability of the development of emotion recognition in bodily movements in dance, which indicates, that deviating to the findings of Boone and Cunningham (1998), the ability to recognize emotions from dance pieces develops prior to the age of four. Moreover, this implies that the processing of facial cues could undergo a similar development as the processing of bodily cues in emotion recognition, as children aged three years in this study had significant recognition rates for all basic emotions. This statement is supported by findings of a study with children who were able to decode emotions from facial cues at the age of three (Pons et al., 2004), which indicates that similar processes may be involved in processing of emotions in face and

in body. With regard to emotion recognition in the validation sample of adults, the ceiling effect could also mean that the children already have a similar good recognition performance of emotions in movements as adults. These results are contradictory to the results Lagerlöf and Djerf (2009) found that 5 or rather 8-year-olds have a comparable good recognition performance of emotions in dance with adults. Moreover, the low overall variance in the emotion recognition tasks in the validation sample of the adults as well as in the sample of children could be an indicator for high presence of structural cues for the emotions in the dance videos, which would facilitate the evaluation of the emotions. This fits into existing research on the development of cue attunement (Boone & Cunningham, 1998). Boone and Cunningham (1998) were able to show in their study that when using many cues with upper-arm-movement, which is considered a structural cue to recognise happiness, the emotion happiness was rated more strongly. In addition, they found that this was also the case for the frequency of cues for directional changes in torso and face, which is a structural cue for recognising anger (Boone & Cunningham, 1998). For this study, this could mean that there were many structural cues for recognising the emotions in the videos, which would explain why almost all participants (children and adults) recognised the emotions.

The second hypothesis that covers age as a predictive factor on emotion recognition rates is in line with previous research on emotion recognition tasks where it could be found that the ability to recognize emotions from faces, but also from dance movements, improves by age, whereby the recognition performance of a 5-year-old was almost the same as that of an adult (Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009). Within in this study, the quality of the emotion, in contrast to Boone and Cunningham (1998), who found that sadness was the first emotion to be recognized in bodily expressions, could not be replicated. Also, the results dealing with the order of development of the ability to recognise basic emotions in faces (Kujawa et al., 2014; Peltola et al., 2011) cannot be confirmed by the results of this study, suggesting that either the development of the abilities to recognise the different basic emotions take place simultaneously, or that this development already exists before the age of 3.

The hypothesis that body awareness improves with age corresponds to existing literature where there is evidence that errors in body awareness and spatial awareness tasks, as well as motor skills, decrease with age, conveying that body awareness

improves with age (Bigelow,1981; Cech & Martin, 2013).

Limitations and Implications

As mentioned above, the modest number of participants, especially for the body awareness data (N = 30), made it difficult to test the relation between emotion recognition and body awareness. Moreover, it should be noted that the present study was an online study and confounding of some variables cannot be ruled out completely. For the confounding of age and gender, it would be a possibility for future research to examine a balanced number of children in one age group using different types of body awareness (e.g., after training on body awareness and before), and compare these within-group results with an older age group in the same condition. This combination of within and between data would give more insight in the development of body awareness over age and different relevant factors. The greater amount of data would also increase the probability of normal contribution of gender in the age groups, and, therefore, minimize the chance of confounding for these variables.

Another limitation was the uncontrollability of individual tasks in the study, as no camera recordings were available. From the coding of the body awareness videos, it could be seen that some parents strongly interfered with the study process by helping their children to perform hand and finger gestures. It is unclear to which extent the children encoded the emotions independently, as they may have been helped by their parents in this task as well. A possible solution to mend this problem would be to test it in the presence of a researcher in the future. The presence of the researcher could also counteract the data loss of videos of the hand and finger gesture, which occurred because of interferences from parents. The researcher could verbally inhibit the support from the parents. As a result of the interference of parents in the hand and finger gestures videos of hand and finger gestures were excluded from coding according to the coding scheme (for more coding details see *Appendix E*)

For future research, the length of time it took the child to respond would also be of interest, as this could provide more insight into emotion recognition ability in relation to age. In addition, because of the design of the study, (screening emotions were presented before the videos) priming on the four emotions displayed in the videos may have occurred (i.e., it is unclear whether children would have recognized the emotions if distractors had been present). The course of the study might also have played a role in

the imitation of the hand gestures as a long period of time had already passed since the beginning of the study and motivational aspects as well as fatigue might have played a role in the imitation of the gestures, especially in younger children. A possible option to prevent this problem for future research would be to pause and re-enter with a shortcut via the keyboard. It would also be important to give clear instructions on how to pause to control other factors. Enabling a break would also lower the inhibition threshold to participate, since in the telephone conversation with the parents, it was often mentioned that the lack of a break was a reason for not wanting to participate.

A further point to consider for future research are the instructions of the hand and finger gestures. From the coding of the videos, it was evident that the parents intervened strongly in the execution of the hand gestures, which led to the exclusion of some data, since the children's functional level could not be adequately represented. In addition, due to users' online format, technical and setting errors, some data was lost, as the hand and/or finger was often not visible to the camera. Moreover, if the parents had technical issues with the study and dropped out, they could enter the study again. For this study, it happened, to the best of my knowledge, twice. Therefore, training effects for the children by seeing the videos twice cannot be ruled out completely. To exclude training effects as far as possible, data from the first fingers and hand gestures (before getting out) were used and only the data from the fingers and hand gestures after getting back in, which had not been made before, were used. This at least led to the fact that the gestures that were evaluated were only performed once, but the children had motor training and practice when performing the last gestures after re-entry, as they were able to repeat the task several times, even if with different gestures. This indicates that the practice of the first gestures could have improved the ability to perform the last gestures. For future research, it would be convenient to store the data on a server and make a re-entry possible at this point were the drop-out happened. This solution would be a possibility to improve the factor of training effects as the participants would have no repetition in tasks and therefore no training in the performance of the gestures.

In addition, the study has a duration of overall 30 minutes, which may have been to long for the children. Duration, especially for the three-year old children, i.e., it cannot be safely excluded that lack of motivation was an aspect for not performing the hand gestures. In the coding of the videos, it was often evident that, at the end, children did

not want to perform gestures. Especially for the children at age three it cannot be said for sure if they did not want to perform the gesture or if they did not have the ability to perform the gesture. The reaction of the parents to the hand gestures of the children also plays a role in the intention as the children may have been more inclined to perform the movement if the parents encouraged them to imitate the gesture. For future research, it would be conceivable to have a researcher present during the test situation to ensure that the varying motivation plays less of a role in the performance of the hand gestures. It would also be recommendable to collect more data with an additional measure of body awareness, as made with the *SPM,* which assessed the ’children’s level of motoric function and detect any abnormalities in motor skills and associated imitation problems in a bigger context. To test if there is a difference between different structural cues for future research, the videos of the dancer could be analysed (as presented in Lagerlöf and Djerf, 2009) with a special computer program for structural cue detection. Another way to gain more comprehensive knowledge across age groups, about the cue attunement of each emotion in varying degrees of intensity, would be the use of an eye-tracking device, in order to identify the gaze as source of information, which cues are fixated longest. This could help to explain why in contrast to other studies (see Boone & Cunningham, 1998; Lagerlöf & Djerf, 2009), in this study, children with a younger age already had good recognition rates in all basic emotions.

Conclusion

Overall, the results of this study contribute to a better understanding of the development of the ability to recognise emotions from (dance) movements by showing that the ability to recognise basic emotions from dance movements is already present before the age of 5 (Boone & Cunningham, 1998), or 4 years (Lagerlöf & Djerf, 2009). Due to other confounding factors (such as age and gender), the study design, and the small number of participants, it is not yet possible to make a clear statement about the role of the factor body awareness, which could have led to individual differences in the recognition of emotions. The following study aimed to shed light on the relationship between age, body awareness, and emotion recognition in dance. It contributes to the evaluation of the role of age in the development of both body awareness and emotion recognition as an important factor for improved emotion recognition. This implies that the development of the ability to recognise emotions from movements improves during

preschool age. For future research, however, it should be investigated to what extent the factors age and body awareness are confounded with each other. In addition, the results of the present study could be used for future research to investigate the development of cue attunement, which plays a role in the decoding of emotions. In conclusion, it can be said that both emotion recognition and body awareness are complex constructs that need to be explored further in order to use the knowledge gained from research and integrate it into relevant fields such as autism research, dance therapy, developmental research, and others. This would be contributing to a more comprehensive understanding of these constructs and using the knowledge about these constructs creates possible interventions, preventions or indications for research and practice.

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List of Abbreviations

SPM *Sensory Processing Measure*

Appendices

A. Abstract English

Embodiment is a construct that describes the interrelation of body, environment, and psyche and assumes that everything we experience, and feel is stored holistically in the body. The related research on the role of the body in emotions, especially in children, is scarce, which is why this study aimed at investigating whether children aged 3-5 years can recognise the basic emotions of anger, happiness, fear and sadness in four dance pieces based on the body movements of the other person and how this is related to the own body awareness. To measure the role of the children's body awareness, the N = 34 children imitated hand- and finger gestures. An external assessment of body awareness was exploratively collected by means of a short questionnaire. From previous research, it was also assumed that there is a relation between the age of the children and the improvement of the ability to recognize emotions. Furthermore, a connection was assumed between the age of the children and the development of their body awareness. Therefore, it was assumed that children who have greater body awareness are better at recognizing the emotions in the dance sequences. Moreover, it was assumed that older children are better at recognizing emotions and are better at performing hand and finger gestures. Results indicated that body awareness predicts not significantly emotional recognition rates. Moreover, it was shown that older children were better at emotion recognition and had more body awareness. The results contribute to the current research in the field of the body's role in emotion recognition and highlight several issues and future directions in researching these.

Keywords: body awareness, children, dance, embodiment, emotion recognition

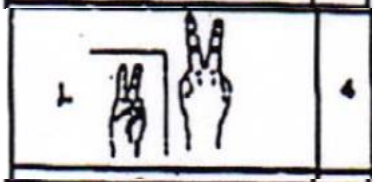
B. Zusammenfassung

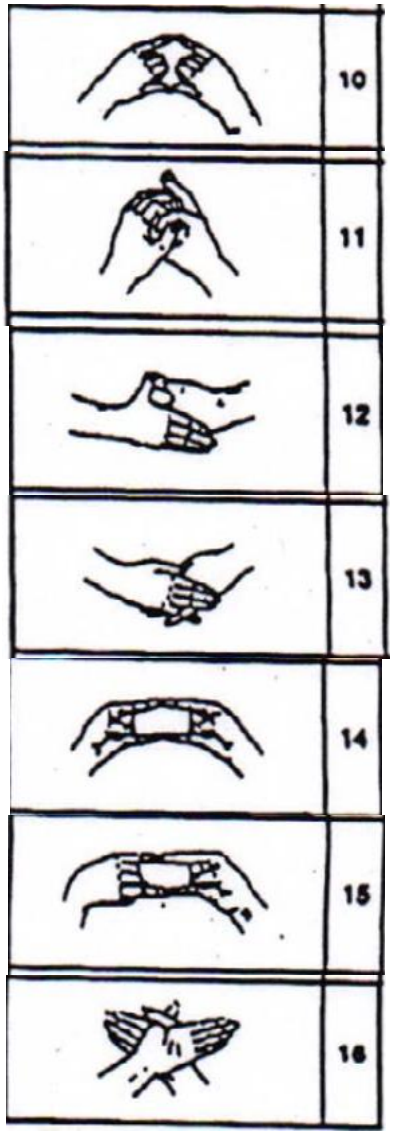
Embodiment ist ein Konstrukt in dem die wechselseitige Beziehung von Körper, Umwelt und Psyche beschrieben wird und welches davon ausgeht, dass Erfahrungen und Gefühle ganzheitlich erlebt und im Körper gespeichert werden. Trotz der wichtigen Rolle des Körpers bei dieser Emotionsspeicherung und- Verarbeitung ist die diesbezügliche Forschung zur Rolle des Körpers bei der Emotionsverarbeitung, insbesondere bei Kindern, spärlich, weshalb in dieser Studie untersucht werden sollte, ob Kinder im Alter von 3 bis 5 Jahren die Grundemotionen Wut, Freude, Angst und Traurigkeit in vier Tanzstücken anhand der Körperbewegungen des Gegenübers erkennen können und wie dies mit der eigenen Körperwahrnehmung zusammenhängt. Um die Körperwahrnehmung der $N = 34$ Kinder zu messen, ahmten die Kinder Hand- und Fingergesten nach. Eine Fremdeinschätzung der Körperwahrnehmung wurde explorativ mittels eines kurzen Fragebogens erhoben. Aus der bisherigen Forschung wurde auch angenommen, dass es einen Zusammenhang zwischen dem Alter der Kinder, als auch der Körperwahrnehmung und der Verbesserung der Fähigkeit, Emotionen zu erkennen, gibt. Des Weiteren wurde ein Zusammenhang zwischen dem Alter der Kinder und der Entwicklung ihrer Körperwahrnehmung angenommen. Es wurde daher angenommen, dass eine bessere Körperwahrnehmung ein Prädiktor für bessere Emotionserkennung in den Tanzsequenzen ist. Außerdem wird angenommen, dass ältere Kinder die Emotionen besser erkennen und die Hand- und Fingergesten besser ausführen können. Die Ergebnisse zeigten, dass die Körperwahrnehmung keinen signifikanten Einfluss auf die Emotionserkennungsraten hat. Darüber hinaus zeigte sich, dass ältere Kinder besser in der Erkennung von Emotionen waren und eine bessere Körperwahrnehmung hatten. Die Ergebnisse tragen zur aktuellen Forschung auf dem Gebiet der Rolle des Körpers bei der Erkennung von Emotionen bei und zeigen verschiedene Probleme und künftige Richtungen bei der Erforschung dieser auf.

Schlüsselwörter: Emotionserkennung, Kinder, Körperwahrnehmung, Tanz, Verkörperung

C. Body Awareness Measurement

Bergès–Lézine's Imitation of Gestures test adapted by Vaivre-Douret (2020)

	Finger Gestures	Notes	1	0.5
1				
2				
3				
4				
5				
6				
7				
8				
9				



Note. Items for Hands (10) and fingers (16); All items are in view of the examiner The scorring key is as following: 0=Failure; 0.5=Step-by-Step; 1=Single step

D. Body Awareness External Measurement

Sensory Processing Measure (SPM; Parham et al., 2007) translated into German by Lisa Herde and Galateé Reme.

Fragen zu Körperbewusstsein und Körperwahrnehmung: Macht ihr Kind Folgendes?

46. Gegenstände (z.B. Bleistift oder Löffel) so fest greifen, dass schwierig wird den Gegenstand zu benutzen

47. Aktivitäten bevorzugen, sie Ziehen, Stoßen, Tragen und Springen involvieren

48. unsicher dabei sein wie weit er oder sie den Körper während Bewegungen heben oder senken soll z.B. wenn er oder sie sich hinsetzt oder über ein Objekt steigen muss

49. Gegenstände so locker greifen (z.B. Bleistift oder Löffel) dass es schwierig wird diese zu benutzen

50. Beim Ausführen bestimmter Tätigkeiten zu viel Druck ausüben: Stampfen (schweres Gehen), Türen zuknallen, oder zu viel Druck bei der Benutzung von Bleistiften oder Buntstiften?

51. Springt viel?

52. Streichelt Tiere mit zu viel Druck?

53. Stößt oder schubst andere Kinder?

54. Kaut auf bestimmten Dingen (Spielzeug, Kleider oder andere Objekte) mehr herum als andere Altersgenossen

55. Zerbricht Dinge und übt zu viel Druck aus beim Schieben oder Stoßen von Gegenständen?

Antwortalternativen: 0=Nie, 1=Manchmal; 2=Häufig; 3=Immer

E. Coding rules from objective assessment

Specified Coding Rules

Type of rule	description
General rule	If a gesture that has to be performed with different hands, is carried out twice on the same side, only the first gesture is scored
General rule	When performing the hand gestures, the palm may face inwards or outwards
General rule	if the second hand is not completely visible and it is highly probable, due to the gesture construction, that the other hand is performing the gesture correctly or incorrectly, evaluate accordingly
General rule	If a parent provides assistance and intervenes, only the execution of the gesture before intervening can be scored, or if it is unclear whether the child would have made the gesture, then the gesture is coded as unscorable.
General rule	If the second hand is used to help, this is not counted as stepwise
General rule	If the child obviously does not participate, this can only be coded as unscorable
Specific gesture: finger 8, finger 9	it does not matter if the thumb is above or below the fingers
Specific gesture: finger 3	Fingers must be placed and not splayed out
Specific gesture: Hand 9, Hand 10	The arms are horizontally parallel one above the other with a distance, the hands are aligned directly above each other