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Nature Pictures for a Restorative School Environment – Effects of Nature Pictures on Pupils' Cognitive and Psychological Functions

Pia Kabitzsch

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Supervisors: Sofia Bunke and Elia Psouni

Abstract

Pupils tend to experience ‘attentional fatigue’ after persistently demanding their attentional system during school hours, resulting in decreased psychological well-being and a lack of attention, along with losses of other cognitive functions. Previous research found natural elements in a school environment to restore pupils’ depleted attentional system. The present study aimed at investigating nature pictures as a restorative source in a classroom setting. Hereby, it was hypothesized that primary school students perceive nature pictures as more restorative than pictures of urban environments. It was further hypothesized that following the presentation of nature pictures, pupils show better cognitive performance and psychological well-being than after the exposure to pictures of built environments. To account for potential sex differences, it was additionally hypothesized that perceived restoration as well as cognitive and psychological benefits following the presentation of nature pictures differs in girls and boys. In total, 40 German primary school pupils attending second to fourth grade completed tasks assessing directed attention and momentary mood state following the presentation of pictures, whereas perceived restoration was measured during the exposure to pictures. The results support that pupils perceived nature pictures as more restorative than of urban environments. However, contrary to expectations, measurements of pupils’ directed attention and momentary mood state did not significantly differ after the exposure to pictures of nature and urban environments. Also, proposed sex differences were not detected. Hence, in the present study, pictures of nature did not function as an indoor source of an immediate restorative experience in a school context.

Keywords: nature pictures, school environment, classroom environment, Attention Restoration Theory, restoration, directed attention, psychological well-being, sex differences

Nature Pictures for a Restorative School Environment –

Effects of Nature Pictures on Pupils' Cognitive and Psychological Functions

During school hours, pupils are demanded to remain quiet in the classroom, to follow instructions of the teacher and to pay attention to the subject matter for many hours a day. For an overall positive school experience and high academic achievements, intact cognitive and psychological functioning of the pupils are crucial (e.g. Han, 2008). However, pupils tend to experience 'attentional fatigue' (Kaplan, 1995, p. 169) after persistently demanding their attentional system during school hours, resulting in decreased psychological well-being and a lack of attention and concentration, along with losses of other cognitive functions (Kaplan, 1995; Han, 2008). Thus, to avoid reduced academic performance and decreased psychological well-being due to depletion of the attentional functions, creating opportunities for pupils to restore their attentional system throughout the school day is of high importance.

Exposure to nature within a school environment has been found to be resulting in enhanced cognitive functions and improved psychological well-being in pupils. Therefore, natural stimuli in a school setting can help overcome the depletion of cognitive functions leading to reduced academic performance and decreased psychological well-being. Until now, research investigated the beneficial effect of the following sources of natural elements in pupils in a school environment: nature walks, green schoolyards, windows facing nature and classrooms equipped with indoor plants. Furthermore, previous research confirmed that being physically present in nature is beneficial with regard to pupils' cognitive and psychological functions (e.g. Kelz, Evans, & Röderer, 2015; Schutte, Torquati, & Beattie, 2017). The beneficial effect of indoor sources such as green walls and plants in classrooms however was found to be limited to pupils' cognitive functions (van den Berg, Wesselius, Maas, & Tanja-Dijkstra, 2017; Daly, Burchett, & Torpy, 2010).

Whereas in adults, a presentation of nature pictures was already found to immediately result in improved cognitive processing and enhanced psychological well-being (Gamble, Howard, & Howard, 2014; van den Berg, Koole, & van der Wulp, 2003), until now, this link has never been explored in children. To address this gap in research, the present study aimed to investigate the perceived restoration of nature pictures in a classroom environment along with the immediate effectiveness of the presentation of nature pictures with regard to cognitive and psychological functions of primary school pupils attending second to fourth grade, while accounting for sex differences.

Findings of the present study provide first insights into nature pictures on classroom walls as a potential source for the replenishment of the pupils' depleted attention throughout the day. If beneficial effects of nature pictures are found in children within the scope of the current study, equipping classroom walls with pictures of natural environments would be a cost-effective and easy implementable addition or alternative to indoor plants. Especially for schools located in cities being unable to allocate an immediate natural outdoor environment, nature pictures would be a great opportunity to provide natural elements in a sufficient scope within a school setting.

The Restorative Potential of Nature

Theoretical approaches that account for the cognitive, psychological but also physiological benefits of being exposed to nature are often based on the assumption of a restorative potential of natural stimuli (Kaplan, 1995). In this context, restoration is defined "as the process of renewing diminished functional resources and capabilities" (Kelz et al., 2015, p. 120). The restorative potential of nature is rooted in the Biophilia hypothesis, postulating that due to adaptation reasons, humans tend to positively react to natural environments (Kellert & Wilson in Scopelliti, Carrus, & Bonaituo, 2019, p. 1). More

precisely, these evolutionary processes enable humans to respond to the characteristics of nature in a restorative way (Han, 2017).

Environments differ in their potential to be restorative and therefore in the degree of being beneficial to the individuals' cognitive and psychological functions. According to Kaplan and Kaplan (1989) the extent of the restorative potential of an environment depends on four restorative properties: the property of giving the individual the impression of *being-away* from daily chores, problems and routines, followed by the need of an environment to be *fascinating* in a sense that it involuntarily evokes the individuals' attention and therefore allows the voluntary attention to rest. Hereby, attention can generally be defined as the "selection of one source of sensory input for increased cognitive processing" (Yantis, 2013, p. 258). Furthermore, the degree of *extent*, of giving the individual the feeling of being connected to something large, determines the restorative potential of an environment. Finally, the authors pointed out the characteristic of an environment to be to some extent *compatible* with the individuals' needs and desires as the fourth restorative property (Stevenson, Schilhab, & Bentsen, 2018). The degree to which an individual experiences an environment to be restorative concerning the four characteristics, defines the restorative potential of the environment. In line with this notion, natural landscapes were found to evoke stronger restorative effects than urban environments (Hartig, Mang, & Evans, 1991).

Since natural environments have high restorative potential, whereas built environments have comparably very low restorative potential, a vast amount of research studies conducted within the field of interest were designed based on this distinction (e.g. Gamble et al., 2014). This way, the beneficial effects of nature can be examined from cognitive and psychological changes when individuals are exposed to a restorative as opposed to a non-restorative environment while controlling for any potential confounding variables coming from the experimental manipulation.

In addition to the four restorative properties, the perceived restorative potential of an environment depends on individuals liking the environment they are exposed to (Hartig & Evans, 1993). Generally, it was found that participants tend to rate natural environments as more beautiful than urban environments (e.g. van den Berg, Hartig, & Staats, 2007). Beyond that conclusion, a study conducted by Herzog, Maguire, and Nebel (2003) revealed a high correlation of $r = .95$ between the individuals' preference of natural over built environments and perceived restoration. Furthermore, preferred environments are not only positively correlated to restoration but were also found to promote restoration. For instance, a study by van den Berg et al. (2003) showed that higher preferences for natural over built environments were associated with greater restoration with respect to psychological functions such as momentary mood state.

Within literature, two major theories have been proposed accounting for the restorative effects of nature on humans: The Stress Reduction Theory by Ulrich (1983) and the Attention Restoration Theory by Kaplan and Kaplan (1989). Research findings of Hartig et al. (1991) suggested that the restorative process begins with attentional and physiological recovering, followed by affective changes. In line with this proposed time sequence, both theories describe different modes of action underlying the restorative effects of being exposed to nature.

Stress Reduction Theory. According to the Stress Reduction Theory, restoration is derived from the reduction of the individuals' stress level. Hereby, stress is defined as "the psychophysiological phenomenon caused when environmental demands reach or exceed an organism's capacity to address those demands" (Bratman, Hamilton, & Daily, 2012, p. 122). Spending time in a natural environment decreases the sympathetic nervous system and increases the parasympathetic nervous activity, which then results in a decreased stress level (Bratman, Daily, Levy, & Gross, 2015). These physiological changes are directly linked to an

increase of positive affect and an improvement in attention and memory functions (Schutte et al., 2017). In particular, a feedback loop connecting the cognitive system with affective arousal has been suggested to account for the stress reduction due to the exposure to natural environments (Bourrier, Berman, & Enns, 2018).

Attention Restoration Theory. Whereas the Stress Reduction Theory claims that restoration is the result of a reduction of an individuals' stress level, the Attention Restoration Theory takes on a more cognitive approach by stating that restoration is derived from the replenishment of depleted directed attention. The Attention Restoration Theory is based on the distinction between directed attention and fascination, following the differentiation in voluntary and involuntary attention after James (Berto, 2005). Contrary to the voluntary or directed attention, which is defined as "the effortful, conscious process of bringing cognitive resources to bear in order to focus on selected stimuli, while avoiding distraction from unrelated perceptual inputs" (Bratman et al., 2012, p. 121), involuntary attention or fascination is effortless, unconscious and allows the attentional system to recover (Berto, 2005). According to Attention Restoration Theory, natural stimuli are intrinsically fascinating in a sense that give rise to the involuntary attention system (Kaplan, 1995). This way, the directed attentional system can rest and recover after attentional fatigue, which develops after persistent use of directed attention for example in a working or school environment (Kaplan, 1995). Hence, being exposed to nature leads inter alia to an improvement in the performance on tests that assess attention and memory, as both cognitive functions rely on directed attention (Bratman et al., 2015). Unlike green landscapes, spending time in more urban environments requires directed attention (e.g. in order not to be hit by a car when crossing the street) and depletes this cognitive resource (Berman, Jonides, & Kaplan, 2008).

Exposure to Nature in a School Environment

In line with the Attention Restoration Theory, attending school for many hours a day results in depleted directed attention (Kaplan, 1995). Supporting this notion, the demand to pay attention to teaching content that is not particularly of interest was shown to lead to a replenishment of the pupils' directed attention (Kaplan & Berman, 2010). Also, a lack of directed attention was found to negatively affect pupils' self-regulation and executive functioning, two fundamental factors of a successful learning experience, along with losses of other cognitive functions (Kaplan & Berman, 2010; Kaplan, 1995).

Previous research investigated the effectiveness of different indoor and outdoor sources of natural elements in pupils to restore their depleted directed attention in a school environment. Within literature, research distinguished between beneficial effects following being physically surrounded by nature and effects of a visual exposure to natural elements with regard to cognitive and psychological functioning in children.

Concerning benefits of physical exposure, Schutte et al. (2017) found a 20-minute walk in natural, as opposed to urban environments to result in improved performance in an attention task in four to five-year-old preschool pupils and seven to eight-year-old children attending primary school. Also, according to teacher reports, preschool children that have daily access to playgrounds with natural elements were more focused during classes than children who play on outdoor areas without such natural elements (Mårtensson et al., 2009). Furthermore, with regard to psychological and physiological benefits, a study conducted by Kelz et al. (2015) showed that schoolyards equipped with natural elements enhanced middle school students' subjective well-being and decreased the participants' stress level, as compared to schoolyards without such natural stimuli. Furthermore, within this study, green schoolyards were found to be perceived as more restorative. However, findings of the study of Kelz et al. (2015) were discussed to be restricted to pupils attending urban schools as a

general lack of contact with nature of inner-city children may have biased the results to some extent.

The Effect of Visual Exposure. The beneficial outcomes of the exposure to nature are not limited to being physically surrounded by nature but also include being exposed to plants in an indoor school environment and looking out a window facing natural landscapes. For instance, findings of a longitudinal study conducted by Wells (2000) found windows facing nature to have a beneficial effect on directed attention of seven to twelve-year-old children. However, as only 17 participants took part in the study of Wells (2000), the generalizability of this finding is limited. With regard to classrooms equipped with indoor plants, a study conducted on Australian school children attending sixth and seventh grade revealed improvements in the pupils' mathematics and spelling abilities after equipping their indoor learning environment with large plants, as compared to pupils' performance in classrooms without such plants (Daly et al., 2010). Furthermore, a longitudinal study by van den Berg et al. (2017) investigated the restorative effect of a classroom equipped with a green wall, a wall made of living plants, in seven to ten-year-old children. Hereby, it was shown that pupils being taught in the green classroom for about four months scored significantly higher in tasks assessing directed attention and evaluated their learning environment as more restorative than pupils attending school in classrooms without a green wall. However, even when positive cognitive changes were detected following the long-term exposure to a green wall, non-randomized trials like in the study conducted by van den Berg et al. (2017) do not allow to draw causal conclusions on the potential benefits of the intervention. Concerning psychological changes, pupils in the green classroom did not report better psychological well-being than children in the control group (van den Berg et al., 2017).

Whereas this particular link was never explored in children, the exposure to nature pictures was found to be beneficial with regard to cognitive and psychological functions in

adults. More specifically, an improvement in attention was reported in a study of Gamble et al. (2014) after participants looked for six minutes at a series of pictures of natural, as opposed to urban scenes. Hereby, to ensure that the participants remained focused and payed attention to the presented pictures, they were asked to evaluate their affection towards every presented picture. In line with findings of Gamble et al. (2014), a study conducted by Berto (2005) demonstrated improvements in a task assessing directed attention after viewing nature compared to non-nature pictures in adults. Before the exposure to pictures, attentional fatigue was intentionally induced by a the performance of a task that depleted the participants' directed attention. Concerning psychological changes following the visual exposure to nature, a study conducted by van den Berg et al. (2003) revealed greater improvement in the participants' mood states after viewing natural landscapes compared to built environments. Lastly, in line with van den Berg et al. (2007), Berto (2005) found adults to be perceiving nature pictures as restorative and non-nature pictures as non-restorative.

Sex Differences. Previous research found that girls and boys differ in their perception and evaluation of environments to be restorative (e.g. Bagot, 2004). In line with the assumption that restoration accounts for the benefits of being exposed to nature, this implies that beneficial effects may differ between girls and boys, depending on their degree of the perceived restorative potential of the environment. Nevertheless, the majority of studies conducted within the field did not incorporate sex differences into the study design. A study that reported analyses of sex differences however found girls performing better on tasks assessing concentration and impulse control when tested in a room with a window facing more natural elements whereas boys' performance did not improve (Taylor, Kuo, & Sullivan, 2002). Hereby, changes in directed attention were assumed to account for improvements in the participants' ability to concentrate and to control impulses when exposed to nature (Taylor et al., 2002). These findings generally suggest that girls may benefit more from the exposure

to natural stimuli with regard to directed attention, than boys. However, in children diagnosed with attentional deficit hyperactivity disorder (ADHD), the two studies that controlled for sex as a confounding variable did not report any sex differences with regard to beneficial changes in children's cognitive functioning following the exposure to nature (Kuo & Taylor, 2004; Taylor & Kuo, 2011). Concerning children's psychological functions, potential sex differences have not yet been explored.

The Present Study

Especially within a school context, research findings reinforced the importance of providing pupils a restorative learning environment by creating opportunities for the children to replenish depleted directed attention throughout the school day. So far, research investigated the effectiveness of nature walks, green schoolyards, windows facing a natural environment and classrooms equipped with plants as potential sources of restoration within a school setting. However, not all schools have resources to provide pupils immediate access to an outdoor natural environment such as a green schoolyard or windows facing natural landscapes. Also, even when indoor plants and green walls have been found to be beneficial with respect to cognitive functions, an improvement of the pupils' evaluation of their psychological well-being could not yet be determined (van den Berg et al., 2017).

Aim. Following the beneficial effects found in adults after the exposure to nature pictures, the present study aimed to investigate the perceived restoration of nature pictures in a classroom environment. Along with the perceived restoration, the immediate effectiveness of the presentation of nature pictures with regard to cognitive and psychological functions of primary school pupils attending second to fourth grade, while accounting for sex differences was aimed to be investigated. The investigation of this particular link in children closes a gap

in literature and contributes to the comparably low amount of research conducted in children within the field of interest so far.

Hypotheses. Within the present study, the perceived restoration of nature pictures in a classroom setting is investigated in pupils attending primary school. Hereby, it was hypothesized that pupils perceive nature pictures as more restorative than pictures of built environments (***hypothesis 1a***). With regard to Bagot (2004) proposing sex differences within the evaluation of environments in terms of restoration, it was further hypothesized that girls and boys differ in their perception of the environments presented in the pictures to be restorative (***hypothesis 1b***).

Furthermore, in line with findings of Gamble et al. (2014) suggesting cognitive improvements in adults after the exposure to nature pictures, the current study investigated the beneficial effect of a presentation of nature pictures in pupils' directed attention. It was hypothesized that following the presentation of nature pictures, pupils perform better in a task assessing directed attention as opposed to after the presentation of pictures showing urban environments (***hypothesis 2a***). Also, as girls' cognitive functions were found to benefit more from the exposure to natural stimuli, than boys' (Taylor et al., 2002), it was additionally hypothesized that girls' performance in the directed attention task improves more after the exposure to nature pictures compared to the presentation of pictures of urban landscapes, than the cognitive performance of boys (***hypothesis 2b***).

Following findings of van den Berg et al. (2003) revealing improvements in psychological mood states after viewing natural landscapes in adults, the present study investigated this particular link in children. Hereby, it was hypothesized that following the presentation of pictures showing natural environments, pupils report being in a better psychological momentary mood state than after the presentation of pictures of urban environments (***hypothesis 3a***). To explore potential sex differences within this link, it was

also hypothesized that the beneficial effect on pupils' psychological momentary mood state after the presentation of nature pictures differs between girls and boys (***hypothesis 3b***).

Methodology

For the investigation of perceived restoration of nature pictures and the hypothesized restorative effect of the exposure to pictures showing natural environments in primary school pupils, an experimental research study was designed. The investigation underlay a within-subject design, thus, the participants performed on both levels of the dependent variables, in the experimental as well as in the control condition. In each condition, the effect of the experimental manipulation on the subjects' performance was measured quantitatively with three dependent variables: perceived restoration, directed attention and momentary mood state. The order of the presentation of the tasks measuring directed attention and momentary mood state after the exposure to pictures was counterbalanced across testing sessions to avoid potential order effects. Additionally, participants were individually randomly assigned to either being in the first session exposed to pictures of natural landscapes and being exposed to pictures of urban environments in the second session, or vice versa. The randomization was considered successful as the distribution of participants with regard to the number, the age range und the sex of participants was approximately similar for both starting conditions (experimental condition: n = 19 with 8 males and 11 females, age range = 7 - 11; control condition: n = 21 with 9 males and 12 females, age range = 7 – 11).

Participants

A total of 46 German children attending second to fourth grade participated in the study. However, due to unexpected absence at one of the testing sessions, six children did not complete both testing conditions and their data was excluded from the statistical analysis,

reflecting a response rate of 86.96 percent. Furthermore, children diagnosed with ADHD were excluded from taking part in the present study as the disorder may distort the effect of being exposed to nature pictures with regard to attentional functioning. The remaining sample consisted of 40 participants (M_{age} = 8.83, SD_{age} = .89, age range = 7 – 11) with 23 girls (M_{age} = 8.81, SD_{age} = .10, age range = 7 - 11) and 17 boys (M_{age} = 8.85, SD_{age} = .74, age range = 7 - 9).

Materials

Experimental Manipulation. Following the approach of comparing the effect of nature stimuli and the effect of urban stimuli on participants' cognitive and psychological functions, participants were exposed to a series of 36 nature pictures (see Appendix A) in the experimental condition and to 36 pictures of urban environments (see Appendix B) in the control condition. In line with Gamble et al. (2014), suggesting a 6-minute presentation of nature pictures to be sufficient to account for benefits of the exposure to nature, each of the 36 pictures was presented to the children for 10 seconds. Following studies that investigated the effectiveness of nature pictures in adults (Gamble et al., 2014; Berto, 2005), nature pictures showed familiar landscapes such as local lakes, meadows and forests. Pictures of urban environments on the other hand were characterized by streets, buildings, traffic and cars. Whereas Figure 1 illustrates an excerpt of nature pictures used within the study, Figure 2 illustrates an example of the presented pictures of built environments.

Figure 1. Excerpt of the series of nature pictures presented in the experimental condition.

Figure 2. Excerpt of the series of pictures of urban environments presented in the control condition.

Rating Task. As the pupils were exposed to a series of nature pictures, rather than one steady natural environment that could be evaluated in terms of the four characteristics of a restorative environment (Kaplan, 1995), the pupils' preference of natural over built environments was used within the present study as an indicator for perceived restoration (Herzog et al., 2003). Thus, in both conditions, the participants were instructed to rate every single picture either with -1 (illustrated with a sad smiley face), 0 (illustrated with a neutral smiley face) or 1 (illustrated with a happy smiley face), depending on their affection towards

the environment presented in the picture (see Appendix C). The average rating of the pictures was calculated for each participant as a final testing score, for both conditions respectively. According to Gamble et al. (2014), the rating task does not demand cognitive resources in a way that it causes attentional fatigue but ensures that the participant's attention remain focused on the presented pictures. Concerning the reliability, the split-half Spearman Brown Coefficient estimated a high reliability for the Rating Task (r_{sb} = .81).

Sky Search Task. To assess the cognitive benefits of the exposure to nature pictures, directed attention in children was measured by the Sky Search Task, a subtest of the 'Test of Everyday Attention for Children' test battery of Manly et al. (2001). Within the scope of the Sky Search Task, the participants were instructed to accurately identify and circle 20 pairs of matching types out of 128 pairs of figures in 40 seconds (see Appendix D). The test score was calculated as the number of correctly identified identical pairs minus the number of incorrectly circled pairs. To reduce practicing effects, different versions of the test with different configurations of the figures were used at the testing sessions. The Sky Search Task was found to have a reliability of r_{sb} = .71 within the present study.

Smiley Test. The momentary mood state, a facet of psychological well-being (van den Berg et al., 2017), was measured by a simple Smiley Test developed by van den Berg et al. (2017). The emotions content, happy, secure, not angry, not tired, not afraid, calm and not sad were each displayed on a Likert-scale ranging from -2 (= not at all applicable) to 2 (= very applicable) and children were asked to evaluate their momentary mood state with regard to the eight emotions (see Appendix E). At the two ends of each scale, smileys underline the meaning of the particular emotion. As an indicator of the participants' momentary mood state, the subjects' score in the Smiley Test was calculated as the average score of all eight emotions. Hereby, the split-half Spearman Brown Coefficient estimated a high reliability for the Smiley Test (r_{sb} = .86).

Procedure

Preparations. In order to be able to conduct the study on German children, the different scales of the Smiley Test were translated from Dutch to German and the oral instruction for the Sky Search Task was translated from English to German. For accuracy, the scales of the Smiley Test were back translated from German to Dutch and the instruction of the Sky Search Task was back translated from German to English, both by a second, independent translator. Furthermore, pictures of urban as well as natural environments were carefully selected with regard to the following aspects: to avoid any potential stress reactions to the urban pictures, it was ensured that the participants were familiar with the environment displayed in the selected pictures as this could be their daily walk to school or to activities. The pictures showing nature motifs were also chosen under the aspect of familiarity. Once the design of the study, the procedure and the instruments were finalized, participants were recruited through three different after-school care centers (in German 'Schulhort') in the federal state of Brandenburg, Germany. The institutions provided approximately similar conditions with regard to natural stimuli, e.g. level of greenness of the schoolyard as well as of the environment of the after-school care center. After seeking approval of the management, parents of children attending second to fourth grade were given an informational letter as well as a consent form (see Appendix F) to fill out and sign if they allow their child to take part in the study.

Main Study. The actual study consisted of two testing sessions, scheduled exactly one week apart. The participants were tested on a group level in groups of six to twelve children, depending on the availability of the participants as well the size of the testing room. Prior to the implementation of the study, the written permission of the participants' legal guardians was collected, and participating children were given general information about the researcher and the procedure of the testing session. The procedure of each session was inspired by a

three-phase paradigm that has been used previously within the field of interest (e.g. Schutte et al., 2017). Originally, as a first step, attentional fatigue is induced, followed by the manipulation of cognitive recovery. Finally, the recovery is assessed using the appropriate measurements. However, as both sessions took place directly after school hours and were scheduled at the same weekday and at exactly the same time period, in the present study it was assumed that participants were not only cognitively tired after attending school for about four to five hours but also experience attentional fatigue on a comparable level in the beginning of both sessions. Before the participants' cognitive recovery was manipulated, the participants were instructed to generally remain quiet, work for themselves and pay full attention to the pictures they were exposed to during the experimental manipulation. Also, they were informed that there was no interest in their individual performance, there were no wrong answers and that the teachers won't be notified about the students' test results. Once everything was settled, the children were presented a series of pictures of nature or of urban environments projected to the wall of the classroom. While looking at the pictures, they rated each picture within the Rating Task. Afterwards the participants completed the Smiley Test, as well as the Sky Search Task with paper and pencil. One session took about 20 minutes and as a thank you for welcoming the researcher in their group, the participants received a little treat at the end of each session.

Testing Environment and Time Frame. The testing sessions were carried out in the premises of the after-school care centers in the first three weeks of June 2019. In order to ensure similar conditions in both testing sessions, the sessions took place in the same room of each after-school care center and under the same lighting conditions. Also, the pictures were presented approximately in the same size. The rooms were equipped with chairs and tables facing the front of the room as well as a beamer in order to project the pictures to the wall.

The windows were covered during the testing sessions and plants were removed from the testing environment to avoid the effect of the experimental manipulation to be distorted.

Data Analysis

To test the proposed hypotheses within a statistical analysis, the Statistical Package for the Social Sciences (Version 25) was applied on an initial data set of 40 participants. For the verification of the hypotheses, mixed-design ANOVAs with scores in the Rating Task, Sky Search Task and Smiley Test in both conditions as within-subject variables and sex as between-subject variable were carried out. Prior to the critical analyses, the model assumptions of normally distributed scores and homogeneity of the error variances in all dependent variables were checked for both factor levels of the between-subject variable, respectively. As all dependent variables were continuous and had only two factor levels, the assumptions of continuous variables and sphericity were presumed and not explicitly tested.

Hypotheses 1a and 1b. Preceding the critical analysis verifying the hypotheses stating that participants perceive nature pictures as more restorative than pictures of urban environments (***hypothesis 1a***) and that girls and boys differ in their perception of the environments presented in the pictures to be restorative (***hypothesis 1b***), three participants were excluded due to a high amount of missing values (< 50 %) in the rating variable. Further individually missing values in the rating variable were handled using Expectation Maximization based on the result of Little's MCAR test suggesting that the individual missing scores are missing completely at random ($p < .05$). As there were no significant outliers detected, the mixed-design ANOVA was applied on a sample of 37 participants with 22 girls and 15 boys ($n = 37$).

Hypotheses 2a and 2b. To eliminate the risk of potentially distorted results, participants that had clearly misunderstood the instruction of the Sky Search Task in the first

session were excluded (*n* = 5; e.g. Sky Search Task-test score in the first session = 0, Sky Search Task-test score in the second session = 14). Furthermore, one significant outlier was removed from the data set prior to the statistical analysis. Hence, the proposed hypotheses claiming that subjects perform better in a task assessing directed attention after the exposure to nature pictures as opposed to pictures of urban environments (***hypothesis 2a***) and that the effect is higher in girls than in boys (***hypothesis 2b***), were checked within the mixed-design ANOVA model on a data set consisting of 34 participants with 22 girls and 12 boys (*n* = 34).

Hypotheses 3a and 3b. Finally, the hypothesis stating that subjects evaluate their momentary mood state more positively following the presentation of nature pictures as opposed to pictures of urban environments (***hypothesis 3a***) and the hypothesis claiming differences between the beneficial effect of nature on pupils' momentary mood state between girls and boys (***hypothesis 3b***), were tested. Due to missing data of one participant in the Smiley Test and the detection of one significant outlier in the dependent variable, two participants were excluded from further analysis. Hence, the mixed-design ANOVA was applied after checking the assumptions of the model to a sample consisting of 22 girls and 16 boys (*n* = 38).

Ethical Considerations

The study was designed according to the ethical guidelines set out by the European Council for Research and was approved by the Ethical Committee at the Department of Psychology, Lund University. Participation was entirely anonymous, and the children's data was labelled with a random subject number. Within the consent form, personal data as the name of the child and the parents, as well as the date of birth of the child were asked. This information was treated entirely confidentially, and the documents have been locked up in a safe place. In order to ensure that parents understood the procedure of the study before they

give their consent, a detailed information letter was provided as well as contact details of the researcher for any further questions. The data analysis was conducted on a group level and thus, it is neither possible to detect a particular child in the data nor make any conclusions about any particular child in specific. Furthermore, participation in this study was completely voluntary and the child or the parent had the right to deny or interrupt participation at any time without giving a reason. Deciding not to participate or choosing to leave the study early did not result in any loss of benefit to which the child is entitled. Lastly, no risks have ever been reported concerning the measurements that were used within the present study.

Results

Prior to the critical analyses, the model assumptions were checked in all dependent variables for both factor levels of the between-subject variable, respectively. As assessed by the Shapiro Wilk Test, average scores in the Rating Task, Sky Search Task and the Smiley Test were normally distributed in all factor levels of the between-subject variable ($p > .05$), except the boys' average Rating Task scores in the control condition ($p = .02$). However, the mixed-design ANOVA model was found to be relatively robust against violations of the normality assumption (Eid, Gollowitzer, & Schmitt, 2010). Concerning the assumption of homogeneity of the error variances, the Levene Test detected no violations of homogeneity in the scores of the dependent variables in all factor levels of the between-subject variable ($p > .05$). Table 1 to 3 demonstrate summaries of descriptive statistics of the scoring in the dependent variables for both sexes, respectively.

Hypotheses 1a and 1b

Table 1.

Descriptive statistics of the average scoring in the Rating Task in experimental and control condition for both sexes, respectively.

	sex	*M*	*SD*	*N*
Experimental condition	male	.76	.16	15
	female	.72	.20	22
	total	.74	.18	37
Control condition	male	.38	.57	15
	female	.37	.43	22
	total	.37	.49	37

The mixed-design ANOVA revealed that on average, participants rated nature pictures in the experimental condition significantly higher than pictures of urban environments in the control condition, $F(1,35) = 19.37$, $p = .00$, partial $\eta^2 = .36$.

Concerning the proposed sex differences within this link, no statistically significant interaction between the average Rating Task-scores on both factor levels and the participants' sex was found by the mixed-design ANOVA, $F(1,35) = .03$, $p = .86$, partial $\eta^2 = .00$. Figure 3 illustrates the differences in the average scores of the Rating Task between the experimental and the control condition for both sexes, respectively.

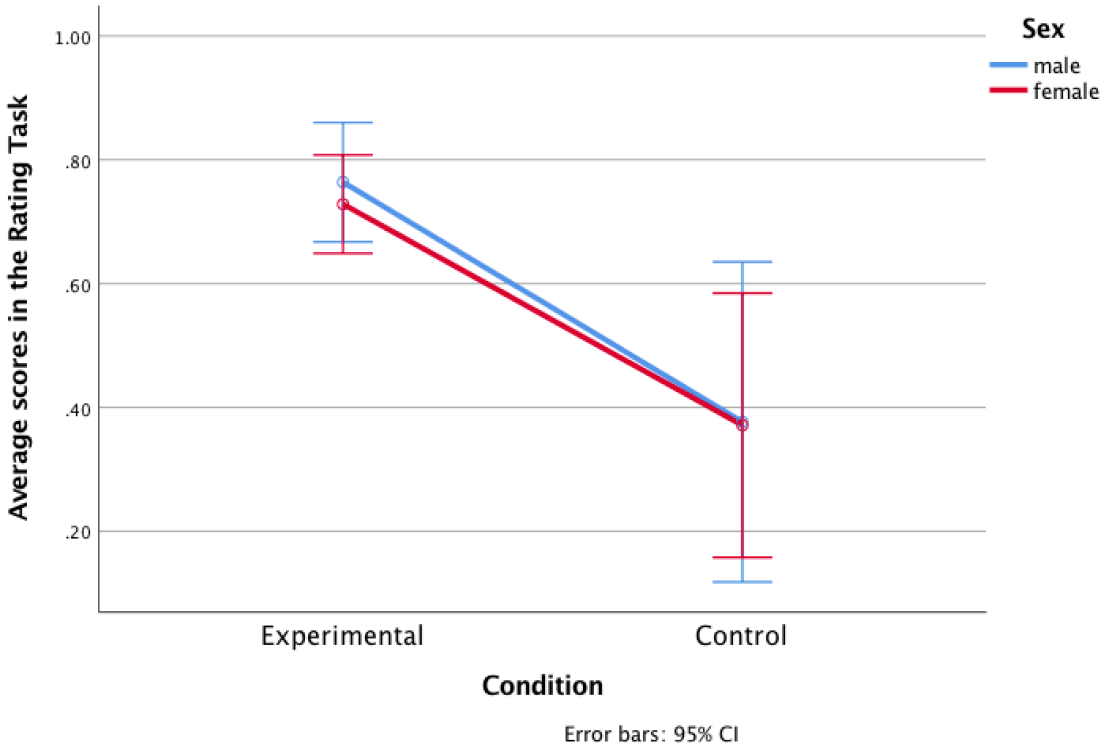

Figure 3. Average scores of the Rating Task in the experimental condition and control condition with standard error for both sexes, respectively.

Hypotheses 2a and 2b

Table 2.

Descriptive statistics of the average performance in the Sky Search Task in experimental and control condition for both sexes, respectively.

	sex	*M*	*SD*	*N*
Experimental condition	male	10.58	2.43	12
	female	9.50	4.02	22
	total	9.88	3.54	34
Control condition	male	11.50	4.01	12
	female	8.27	3.41	22
	total	9.41	3.90	34

The statistical analysis showed that there was no significant difference between the Sky Search Task scores in the experimental and control condition, $F(1,32) = .07$, $p = .40$, partial $\eta^2 = .00$.

The mixed-design ANOVA found the interaction between the Sky Search Task scores on both factor levels and the participants' sex to be close to significance, $F(1,32) = 3.24$, $p = .08$, partial $\eta^2 = .09$. Figure 4 illustrates the differences in the average scores of the Sky Search Task between the control and the experimental condition for both sexes, respectively.

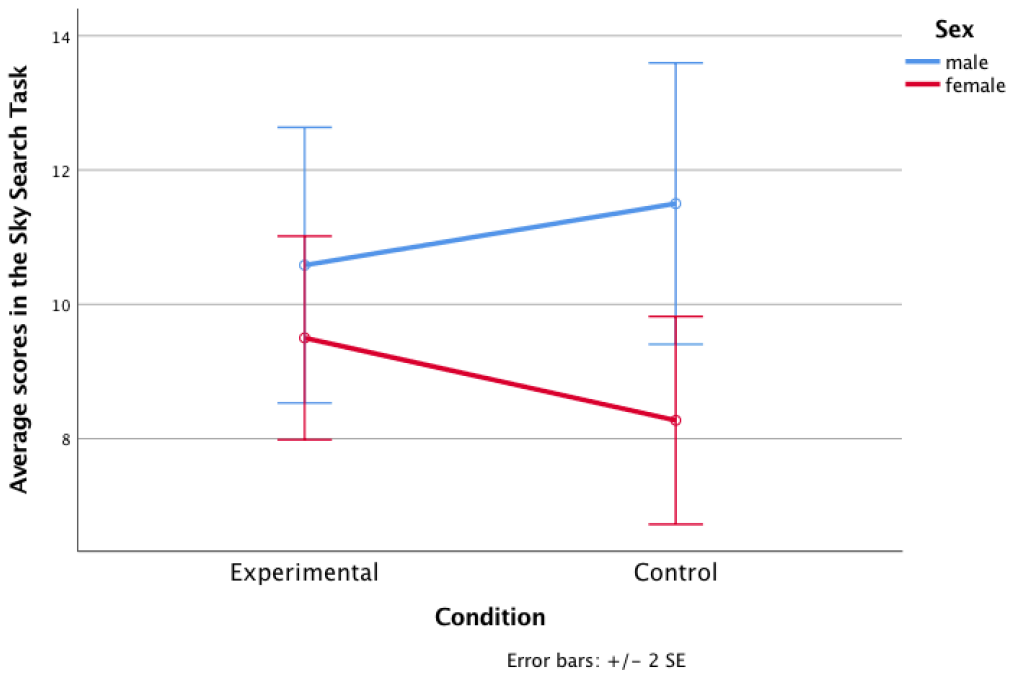

Figure 4. Average scores in the Sky Search Task in the experimental condition and control condition with standard error for both sexes, respectively.

Hypotheses 3a and 3b

Table 3.

Descriptive statistics of the average scoring in the Smiley Task in experimental and control condition for both sexes, respectively.

	sex	*M*	*SD*	*N*
Experimental condition	male	1.27	.53	16
	female	1.35	.55	22
	total	1.32	.53	38
Control condition	male	1.02	.70	16
	female	1.27	.66	22
	total	1.16	.68	38

The mixed-design ANOVA detected the difference between the Smiley Test scores in both conditions to be close to significance, $F(1,36) = 2.59$, $p = .06$, partial $\eta^2 = .07$.

Lastly, no statistically significant interaction between the scores in both levels of the Smiley Test and the participants' sex was found within the application of the mixed-design ANOVA, $F(1,36) = .42$, $p = .42$, partial $\eta^2 = .02$. The differences in the average rating scores of the Smiley Test between the control condition and the experimental condition are demonstrated in Figure 5 for both sexes, respectively.

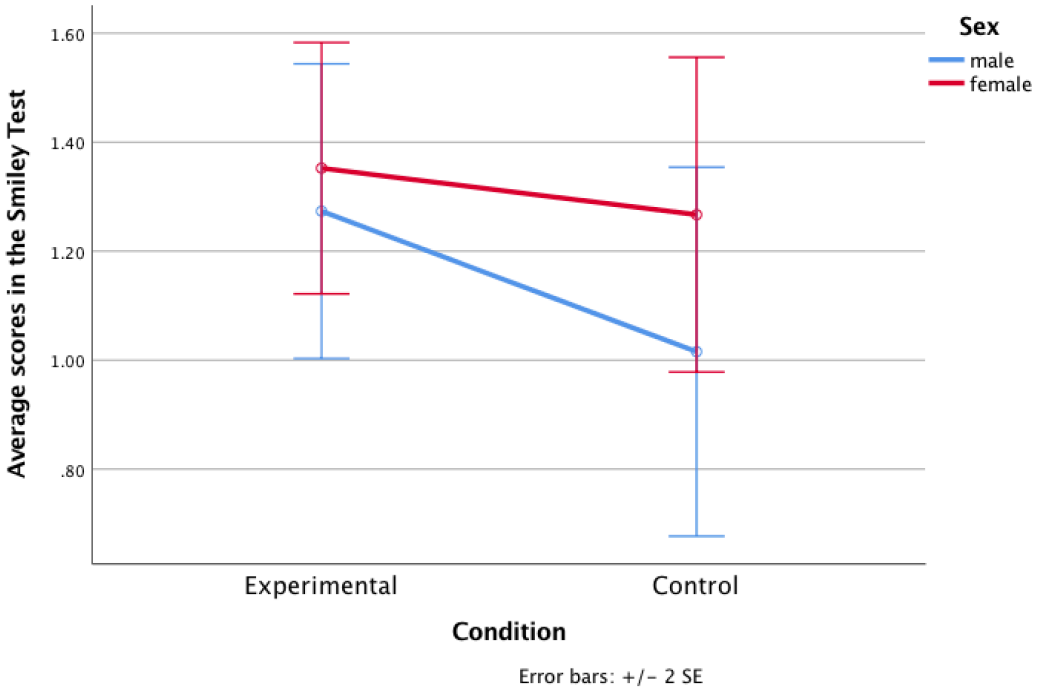

Figure 5. Average scores in the Smiley Test in the experimental and the control condition with standard error for both sexes, respectively.

Discussion

Overall, the present study aimed to investigate the perceived restoration of nature pictures in a classroom environment along with the immediate effectiveness of the presentation of nature pictures with regard to cognitive and psychological functions of primary school pupils attending second to fourth grade, while accounting for sex differences.

The first hypothesis, that pupils perceive nature pictures as more restorative than pictures of built environments, was supported within the scope of the present study. This finding is in line with Kelz et al. (2015), reporting school environments to be perceived as more restorative when equipped with natural elements. However, within the study of Kelz et al. (2015) perceived restoration was assessed with the 'Perceived Restorativeness Scale' whereas within the present study, the pupils' preference of pictures of natural over built environments was used as an indicator for perceived restoration. Furthermore, this finding is

consistent with van den Berg et al. (2007) who reported that along with the perception of natural environments to be more restorative, adults also tend to evaluate nature as more beautiful than built environments. Therefore, with respect to Herzog et al. (2003) who revealed a high correlation of $r = .95$ between the individuals' preference of natural over built environments and perceived restoration, it can be assumed that pupils perceived pictures of nature as more restorative than pictures of urban environments.

When accounting for sex differences within this link, the hypothesis that girls and boys differ in their perception of the environments presented in the pictures to be restorative was not supported. This result contrasts with findings of Bagot (2004) suggesting that girls and boys generally differ in their perception and evaluation of environments to be restorative. There are three main differences between the study of Bagot (2004) and the present study that may account for the different results. Firstly, within the scope of the present study, preference of natural over built environments was used as an indicator of the perceived restorative potential of the environments. In the study of Bagot (2004) however, perceived restoration was assessed by the author-developed 'Perceived Restorative Components Scale for Children' following the four restorative characteristics of an environment proposed by Kaplan (1995). Even when Herzog et al. (2003) report a high correlation between preference of nature over built environments and perceived restoration, the two concepts cannot be equated. Secondly, within the study of Bagot (2004), differences between girls and boys were found within their reported perceived restoration of environments such as the playground and the library. However, within the present study, the participants were exposed to environments they most likely never specifically experienced in person. Lastly, the differences in exposure to natural environments within the present study and the study of Bagot (2004) may account for the inconsistency of results. In the study of Bagot (2004), children were asked to evaluate the

restorative potential of environments they were physically present in. In the current study however, participants were visually exposed to pictures of natural landscapes.

The second hypothesis, that pupils perform better in a directed attention task following the exposure to nature pictures as opposed to pictures of urban environments, was not supported. The fact that pupils generally prefer natural over built environments may suggest that this was not due to the perception of pictures of natural and urban environments as equally restorative. Rather, this result implies that the exposure to nature may not have an effect on children's directed attention. Nevertheless, this assumption contrasts with the findings of van den Berg et al. (2017) showing that children performed better in a task assessing directed attention when surrounded by natural stimuli as opposed to not being surrounded by natural elements. However, even when the study of van den Berg et al. (2017) and the present study both rely on the same task assessing children's directed attention (Sky Search Task), the findings underlay a different kind of exposure and study design which may account for the inconsistent results. Whereas in the study of van den Berg et al. (2017) participants were surrounded by a green wall in their classroom for about four months, the present study examined the immediate effect of a six-minute presentation of a series of nature pictures in children's directed attention. Whereas in adults a six-minute presentation of nature pictures was found to be beneficial with regard to the participants' cognitive functions (Gamble et al., 2014), the present finding suggests that a six-minute exposure to nature may not have been sufficient enough to account for cognitive benefits in children. Furthermore, following the assumption of the Attention Restoration Theory (Kaplan & Kaplan, 1989) that cognitive benefits from the exposure to nature underlies the replenishment of depleted directed attention, it is possible that the pupils' directed attention was not fatigued enough before the experimental manipulation. Even when attending school lessons for about four

hours had depleted the pupils' attentional system as proposed, their directed attention may have been restored to some extent on their way from the primary schools to the after-school care centers. This is in line with findings of Schutte et al. (2017) showing that cognitive recovery in children is promoted by a 20-minute walk in natural environments. Also, the fact that attentional fatigue was not intentionally induced within the present study before the intervention may account for the inconsistency of findings of the current project and a study conducted by Berto (2005), reporting improvements in directed attention after viewing nature compared to non-nature pictures in adults. Hereby, participants worked on a task that depleted their directed attention before the experimental manipulation.

Contrary to the expectations, the hypothesis that girls' directed attention benefits more from the presentation of nature pictures than boys' directed attention, was not supported. Even when this is to some extent in line with the non-significant result of hypothesis 1b, this result is inconsistent with study outcomes of Taylor et al. (2002), who reported positive changes in girls', but not in boys' cognitive functions that depend on directed attention when being tested in a room with windows facing natural elements. However, even when the study of Taylor et al. (2002) was conducted on children in the same age group, the kind of exposure, as well as the assessed cognitive functions were different, which may account for the inconsistent findings. Furthermore, contrary to the current study purpose investigated in children living close to nature, the participating children in the study of Taylor et al. (2002) lived and were tested in an urban environment. According to Kelz et al. (2015) inner city children generally lack in contact with nature and are therefore more in need of an exposure to natural elements than children living close to nature. This proposed neediness of participants may have biased the results of the study of study of Taylor et al. (2002) to some extent. Also, even though the result of the critical analysis underlying the verification of hypothesis 2b did not reach significance, it is striking that within the present study, girls tend to perform better

in a task assessing directed attention after being presented nature pictures, whereas boys tend to perform better in this task following the presentation of pictures of urban environments (see Figure 4 or Table 2). This may imply that the presentation of nature pictures restored girls' but not boys' directed attention. However, this implication would be contradictory to Kaplan and Kaplan (1989) stating within the Attention Restoration Theory that directed attention in all individuals with a sound attentional system benefits from contact with nature. In line with that, the assumption would also be inconsistent with findings of research studies reporting cognitive improvements when exposed to natural elements in girls and boys (e.g. van den Berg et al., 2017). With regard to the four characteristics of a restorative environment proposed by Kaplan and Kaplan (1989), it is possible that boys perceived pictures of urban environments showing streets and cars but also some natural elements as more restorative than the pictures of nature. This would be in line with Kaplan (2001) suggesting that the perceived restorativeness of an environment depends on previous personal experiences. From an intuitive point of view, boys may spend more time playing in the streets and are more fascinated by cars and traffic than girls which may account for the unexpected trend in the outcome. However, this is to some extent inconsistent with the outcome of the verification of hypotheses 1b stating that girls and boys generally prefer pictures of natural over pictures of urban environments. Further research is needed to investigate the perceived restoration in children (e.g. with the 'perceived restorative components scale for children' developed by Bagot, 2004) as well as the benefits of the environment with regard to children's directed attention for both sexes respectively.

Even when a strong trend towards significance was detected, the hypothesis stating that following the presentation of nature pictures, pupils report being in a better momentary mood state than after the presentation of pictures of urban environments, was not supported

within the present study. As pupils generally preferred natural over urban environments which was used as an indicator of the pupils' perceived restoration of the environments within the present study, it could be concluded that the outcome was not due to the perception of pictures of natural and urban environments as equally restorative. Rather, this result implies that the exposure to nature may not have a strong effect on children's psychological well-being. Nevertheless, this assumption would be contrary to findings of a study conducted by Kelz et al. (2015) reporting improved psychological well-being in pupils attending middle school after equipping their schoolyards with natural elements. However, the study of Kelz et al. (2015) and the present study were conducted on a different age group, used a different kind of intervention as well as different tests assessing psychological benefits which may account for the inconsistent outcome. Results of van den Berg et al. (2017) on the other hand are similar to findings of the present study. This implies that equipping classrooms with green walls but also with nature pictures may not provide a sufficient degree of perceived restoration with regard to the restorative mechanism underlying the beneficial changes in pupils' psychological functions (Hartig et al., 1991), whereas being physically active surrounded by natural elements does (Kelz et al., 2015). However, the strong trend towards significance detected in the data of the present study suggests that nature pictures in classrooms may be more beneficial with regard to pupils' psychological functions, than indoor plants such as a green wall. Nevertheless, in adults the presentation of a nature movie was found to be beneficial with regard to the participants psychological well-being (van den Berg et al., 2003). Within the study of van den Berg et al. (2003), the participants were exposed to a frightening movie before the actual intervention to intentionally increase their stress level. Hereby, in line with assumptions of the Stress Reduction Theory, people who are initially stressed and in a highly aroused state were found to benefit the most from interacting with nature (Bourrier et al., 2018). Along with other discrepancies such as different age

group, inconsistent tests assessing psychological mood state and a different kind of intervention, the lower stress level of the participants within the present study may account for the inconsistent results between the study of van den Berg et al. (2003) and the current project. This indicates that pupils may need to be in an aroused state in order for their psychological functions to benefit from an indoor exposure to natural stimuli.

The hypothesized sex difference concerning the beneficial effect on pupils' momentary mood state following the presentation of nature pictures was not supported within the scope of the present study. Even when previous research generally reported improved psychological well-being after an exposure to nature in adults and children (e.g. van den Berg et al., 2003; Kelz et al., 2015), sex differences were not yet investigated within this link until now. However, as sex differences were found in girls' and boys' cognitive functions when looking out of a window facing natural elements in the study of Taylor et al. (2002) and also in the perceived restoration of an environment (Bagot, 2004), an exploration of sex differences within the current link is valuable. From the insignificant result of the verification of hypothesis 3b it can be generally concluded that girls' and boys' momentary mood states benefit to the same extent from the presentation of nature pictures. However, with regard to the small effect size of partial $\eta^2 = .02$, it is questionable if an existing sex difference would have been detected within the inadequate sample size.

Limitations and Strengths

The discussed findings may be restricted by the limitations of the present study. Firstly, from the study design it can only be assumed why the presentation of nature pictures did not improve the performance in the measurements assessing directed attention and momentary mood state as expected. It is possible that the pupils were not sufficiently attentionally fatigue or rather aroused to benefit from the intervention. Furthermore, even when participants

preferred pictures of natural over built environments which indicates that pupils perceived nature pictures as more restorative, the six-minute presentation of nature pictures may not have been sufficiently restorative to account for any improvements with regard to pupils' cognitive and psychological functioning. Also, there is no certainty that the detected trends in the data were due to restoration arising from the intervention or due to the fact that the presentation of pictures of urban environments depleted the pupils' directed attention more than the presentation of nature pictures. A third session where baseline measurements were assessed would have been needed to account for this limitation. However, short and as few testing sessions as possible are the key when conducting research with children. Secondly, with regard to generalizability of the findings, it needs to be noted that the outcome of the present study is limited to pupils attending second to fourth grade in schools located in rather natural environments. Hence, the external validity of the present study is compromised. Also, the sample size of 40 participants was rather small compared to other studies conducted within the field of interest. As a comparison, 67 children participated in the study of Schutte et al. (2017), 170 children took part in the study of van den Berg et al. (2017) and lastly, findings of Kelz et al. (2015) are based on a sample size of 133 middle school pupils. Following the small effect sizes, the comparably small sample size may account for some of the null effects but also, on the other hand, for the detected trends towards significance. Also, it cannot be completely excluded that participants may have been affected by very mild symptoms of ADHD, which were not diagnosed, or the teachers of the children whose parents were not talked to in person during recruitment were not informed of. This could have biased the outcomes especially with regard to assessed directed attention. Further limitations arouse from the measurements used to assess the pupils' directed attention and momentary mood state. Even when different versions of the Sky Search Task were used in the sessions, a practicing effect was suspected as pupils systematically performed better in the second

session than in the first session. However, as the randomization to the starting conditions was successful, this should not have distorted the outcomes. Besides the limitation that the assessed momentary mood state of the pupils only covers one of the facets of psychological well-being (e.g. van den Berg et al., 2017), comments of children while working on the Smiley Test indicated that their momentary mood state is to a large extent dependent of current events. Comments like “I am very angry as my friend did not want to play with me earlier.” or “I am very happy but also restless as my friend is coming over later today.” may have influenced their reported momentary mood state, completely independent of the intervention. Generally, self-reported data was found to threat the construct validity of research studies as this kind of data collection is prone to response biases (van de Mortel, 2008). Concerning the translation and back-translation of the instruction of the Sky Search Task and the scales of the Smiley Test prior to the implementation, it needs to be noted that no expert within the research field was consulted. Therefore, it cannot be ensured that the psychological concepts were perfectly corresponding between both languages. Furthermore, due to the presentation of a series of nature pictures rather than one steady environment equipped with nature pictures, the perceived restoration of each presented environment could not be assessed with a scale covering the four restorative characteristics of a restorative environment (Kaplan, 1995). Within in the scope of the present study, the preference for natural over built environments served as an indicator. However, pupils’ preference for natural environments cannot be put on a level with perceived restoration. Furthermore, the fact that children were reminded for about one second after every picture to rate the environment presented in the picture, may have disturbed children during the proposed restoration process. Lastly, it needs to be noted that the pictures were projected on the classroom walls with a beamer. Therefore, the quality of the pictures was not ideal which also may have also influenced the effectiveness of the intervention.

Besides the discussed limitations, the present study also had some methodological strengths. For instance, as the study underlay a within-subject design, distorted results due to individual differences of the participants between the control and experimental group were eliminated. Another strength of the present study was the random assignment of each of the participants to be either attending the experimental or control condition first instead of appointing a whole class to a starting condition. This way drawing causal conclusions on the benefits of the intervention would have been allowed if detected. Also, in order to eliminate the risk of biased study outcomes due to a general lack of contact with nature in children attending inner city schools (Kelz et al., 2015), after-school care centers visited by children attending schools located in a more natural environment were chosen. Concerning the measurements used within the study, the high reliabilities of the measurements proved that the used instruments obtain similar results consistently. Also, the study was one of the few studies within the field of interest that accounted for sex differences. Lastly, in favor of the ecological validity, the study was conducted in the field rather than in a laboratory.

Suggestions for Future Research

Even when the limitations may restrict the findings of the present study, they also provide suggestions for future research. Firstly, when investigating the immediate beneficial effect of the presentation of nature pictures in children, the presentation is advised to be longer than six minutes as such short exposure was not found to be effective within the present study. Also, it should be ensured that the sample size is appropriate with regard to the small effect sizes reported in previous research and that participants are either sufficiently attentionally tired or in an aroused state before the intervention. Secondly, instead of limiting the pupils' psychological well-being to their momentary mood state, scales like the ability to concentrate, the social climate in the classroom and self-image of the pupils should also be considered and

assessed as facets of psychological well-being (van den Berg et al., 2017). Thirdly, concerning generalizability, it is advised that future research investigating the beneficial effects of the presentation of nature pictures in children includes pupils attending schools located in urban as well as in natural environments. Fourthly, it would be interesting to explore the long-term effect of classroom walls equipped with nature pictures on pupils' cognitive and psychological functions. This way, potential improvements of perceived restoration of the classroom can be assessed with the 'perceived restorative components scale for children' developed by Bagot (2004). Lastly, to determine whether the potential benefits of the presentation of nature pictures underlie stress reduction as proposed by the Stress Reduction Theory or rather attention recovery as suggested by the Attention Restoration Theory, combining measurements of cognitive, psychological and physiological functions is important within future research (Schutte et al., 2017).

Conclusion

This was the first investigation of (immediate) beneficial effects in pupils' cognitive and psychological functions following the presentation of a series of nature pictures in a classroom environment, while accounting for sex differences. Hereby, improved directed attention and momentary mood state were expected after the exposure to nature pictures, two important functions that are crucial for an overall positive school experience and pupils' academic performance. However, even when children perceived nature pictures as more restorative than pictures of built environments, findings of the present study indicate a lack of effectiveness of the intervention as beneficial effects could not be detected in girls' and boys' cognitive and psychological functioning following the presentation of nature pictures. Nevertheless, trends towards significance were found within the expected beneficial effect of the presentation of nature pictures in pupils' psychological functions as well as within the

proposed sex difference stating that girls' directed attention benefit more from the exposure to nature pictures than boys' cognitive functioning. However, even when pictures of nature may contribute to a restorative classroom environment, nature pictures were not found to be accounting for improvements in pupils' cognitive and psychological functioning due to restoration within the present study. Potential reasons for the ineffectiveness of the intervention as well as strengths and limitations of the study were discussed. A replication of the present study is needed taking the suggested changes into account.

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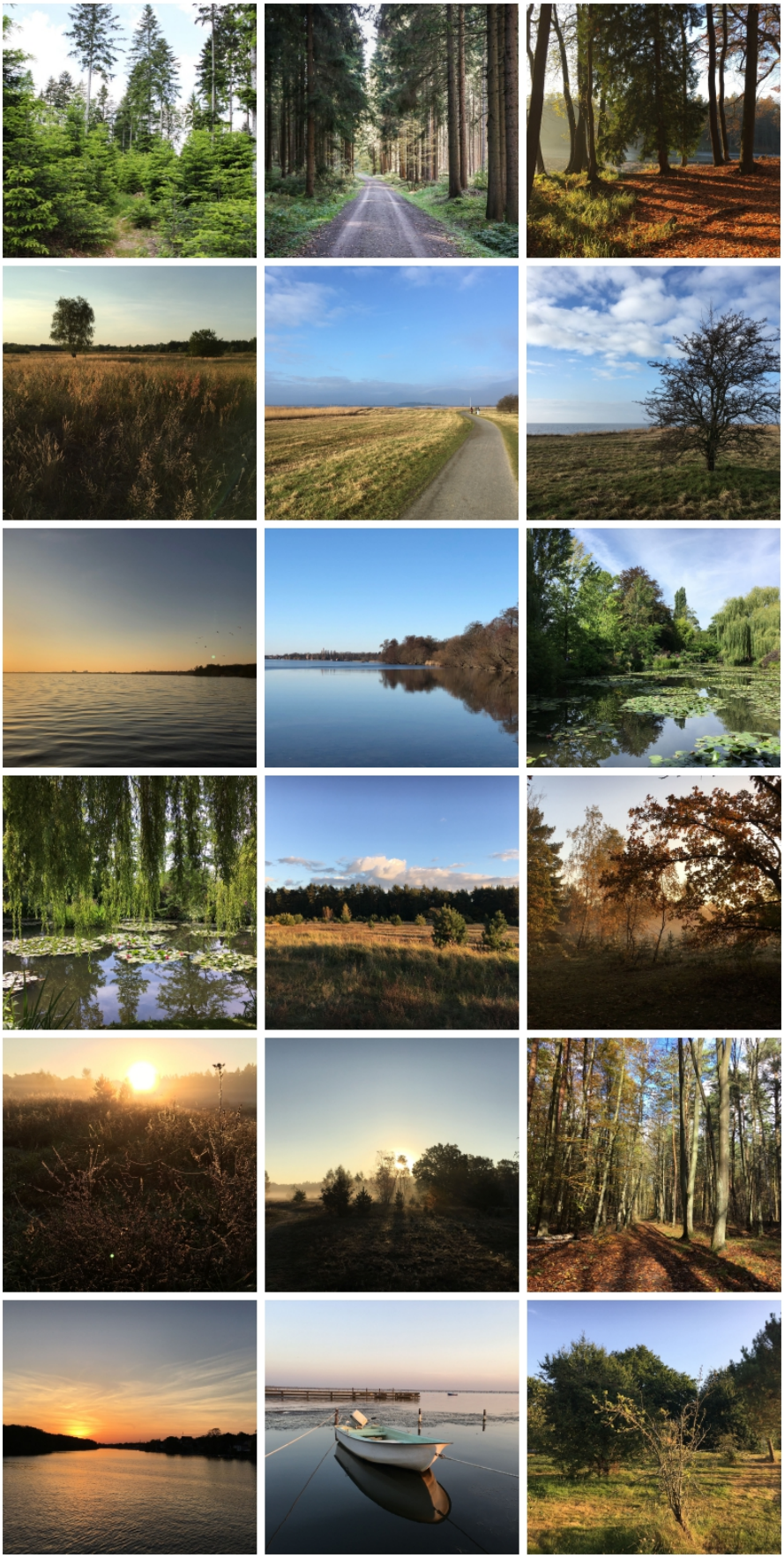
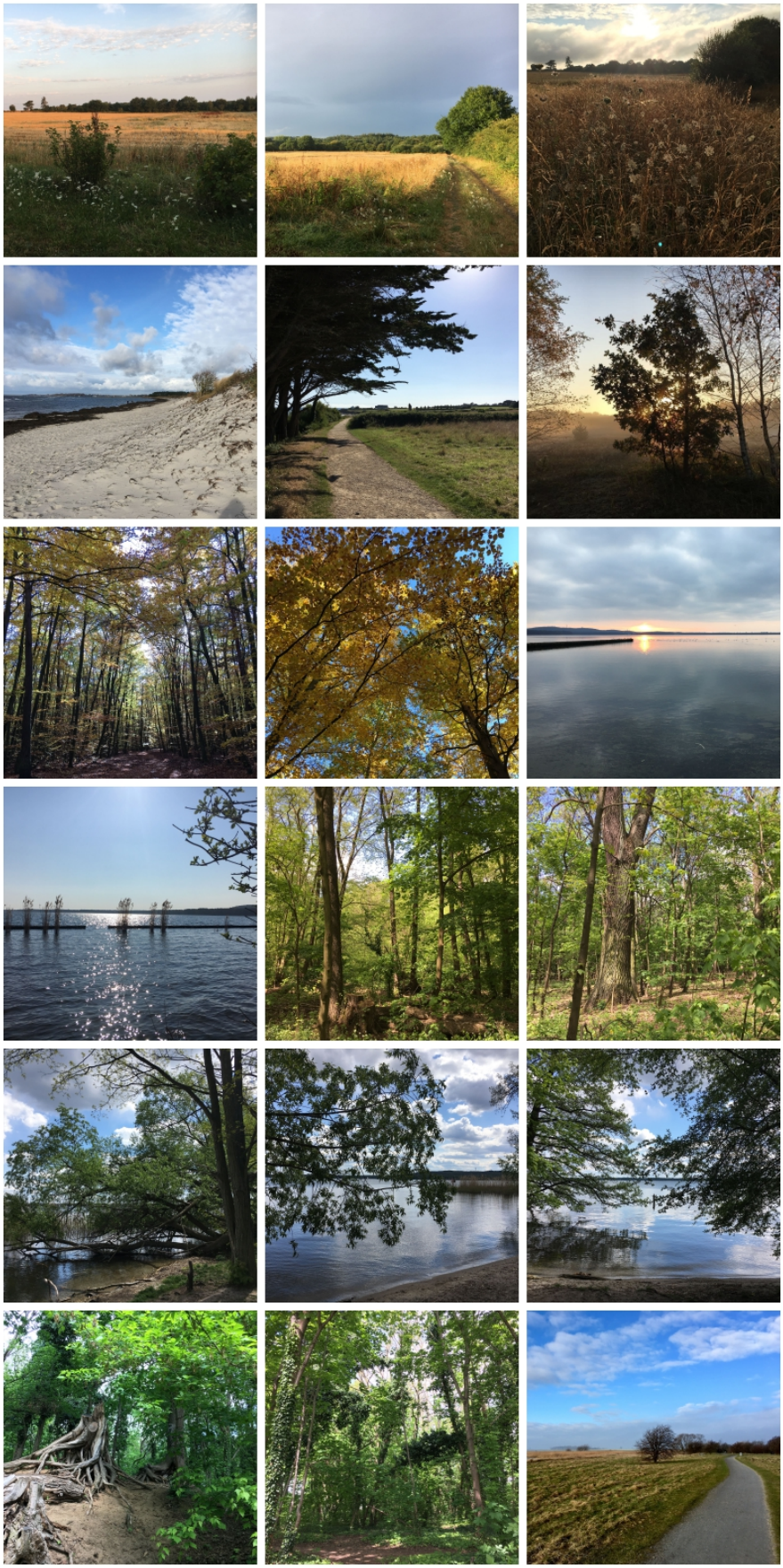
Appendix A





Appendix B

Appendix C

Wie gefallen dir die Bilder?

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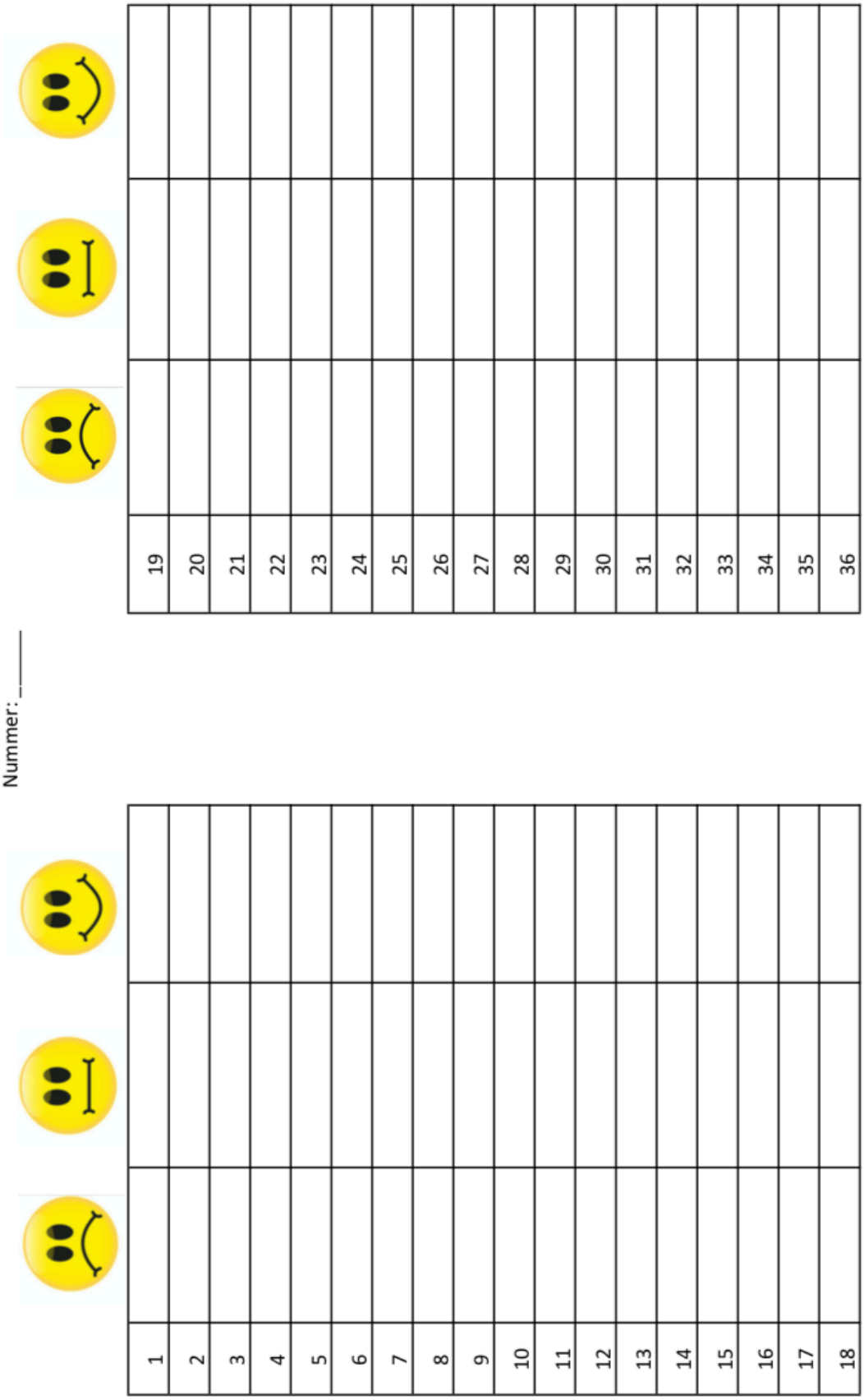

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Appendix D

SKY SEARCH TASK (A)

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Mädchen ☐

Junge ☐

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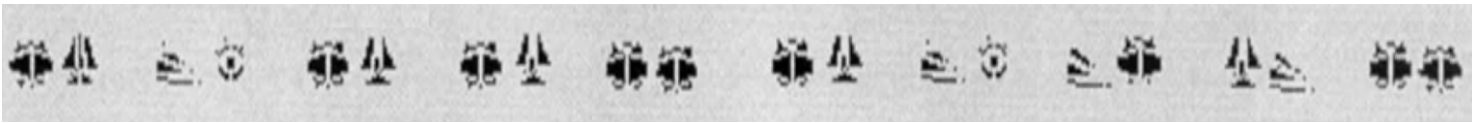

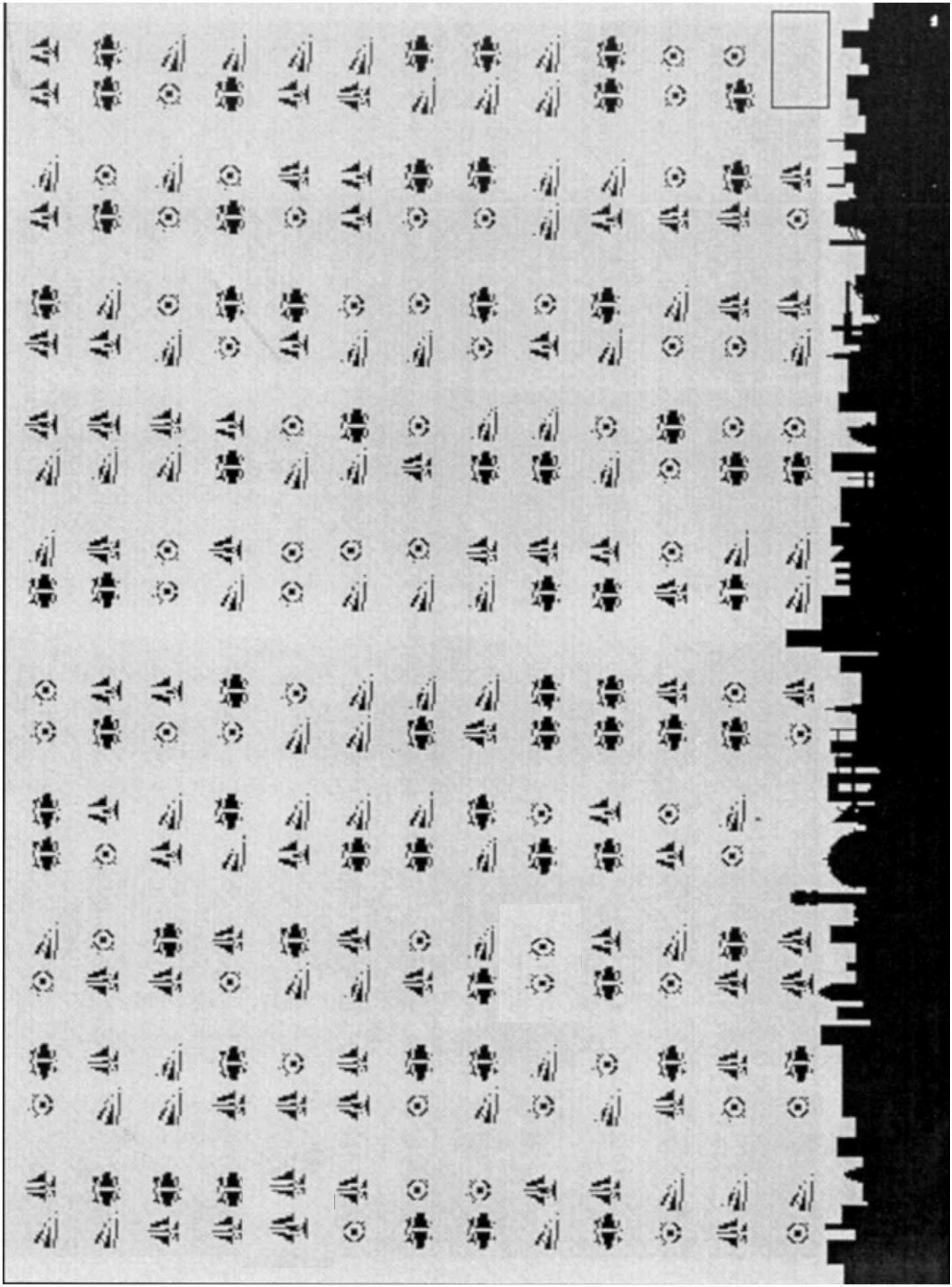

Appendix E

Nummer: _____

Wie fühlst du dich gerade? (A)

	sehr müde	müde	Beides gleich	nicht müde	überhaupt nicht müde	
	sehr ängstlich	ängstlich	Beides gleich	nicht ängstlich	überhaupt nicht ängstlich	
	sehr unruhig	unruhig	Beides gleich	ruhig	sehr ruhig	
	sehr traurig	traurig	Beides gleich	nicht traurig	überhaupt nicht traurig	
	gar nicht fröhlich	nicht fröhlich	Beides gleich	fröhlich	sehr fröhlich	
	sehr unglücklich	unglücklich	Beides gleich	glücklich	sehr glücklich	
	sehr unsicher	unsicher	Beides gleich	sicher	sehr sicher	
	sehr böse	böse	Beides gleich	nicht böse	überhaupt nicht böse	

Appendix F

LUND UNIVERSITY
DEPARTMENT OF PSYCHOLOGY

Bitte um Einverständnis zur Durchführung einer kurzen „Naturstudie“

Liebe Eltern der Kinder der 2. bis 4. Klasse,

mein Name ist Pia Kabitzsch und ich studiere Psychologie an der Lund University in Schweden. Im Rahmen meiner Masterarbeit möchte ich in Zusammenarbeit mit meiner Betreuerin Professor Sofia Bunke (sofia.bunke@psy.lu.se) und der Psychologin Elia Psouni (elia.psouni@psy.lu.se) den **Einfluss von Naturbildern auf die Aufmerksamkeitsvorgänge bei Grundschulkindern** in meiner Heimat Berlin/Brandenburg erforschen.

Wissenschaftliche Studien haben bereits gezeigt, dass sich ein Spaziergang durch die Natur sowohl bei Kindern als auch bei Erwachsenen, positiv auf das Wohlbefinden auswirkt, Stress reduziert und Aufmerksamkeitsvorgänge begünstigt, die für die Lernerfolge in der Schule sehr wichtig sind. Da jedoch nicht jede Schule ihren Schülern einen direkten Zugang zur Natur ermöglichen kann, möchte ich erforschen, ob Naturbilder ebenfalls einen Effekt auf die Aufmerksamkeitsprozesse der Schulkinder haben.

In Absprache mit der Hortleitung und unter der Aufsicht von Herrn/Frau _____ wird die Studie von mir sowohl am _____, als auch am _____ **während der Hortbetreuung** durchgeführt. Die Termine dauern jeweils nicht länger als **15 min** und die Kinder werden in der Gruppe getestet. Die teilnehmenden Kinder werden während beiden Testungen gebeten einen kurzen Aufmerksamkeitstest zu bearbeiten sowie ihr aktuelles Wohlbefinden mit dem „Smiley Test“ zu bewerten. Um den Effekt von Naturbildern auf die Aufmerksamkeitsvorgänge der Kinder zu testen, schauen sich die Kinder während beiden Sitzungen 6 min lang unterschiedliche Landschaftsbilder an. Als Dankeschön für ihre Teilnahme werden die Kinder mit einer kleinen Süßigkeit belohnt.

Die Studie wurde gründlich von der Ethikkommission geprüft und birgt **keinerlei Risiken**. Des Weiteren ist die Teilnahme **anonym**, da die Daten so pseudonymisiert werden, dass Rückschlüsse auf Ihr Kind ausgeschlossen sind. Auch die personenbezogenen Daten (Name, Geburtsdaten etc.), die ich im Rahmen der Einverständniserklärung erfrage, werden streng vertraulich behandelt und an einem sicheren Platz weggeschlossen. Da ich nicht an der „Leistung“ einzelner Kinder, sondern viel mehr an dem allgemeinen Effekt von Naturbildern auf die Aufmerksamkeitsprozesse interessiert bin, werden **keine Einzelauswertungen** vorgenommen. Den Erziehern wird ebenfalls die „Einzelleistung“ Ihres Kindes in den Aufmerksamkeitstests nicht zurückgemeldet.

Die Teilnahme Ihres Kindes ist **freiwillig**. Bei Nichtteilnahme entsteht keinerlei Nachteil für Ihr Kind.

Bitte zögern Sie nicht mich bei weiteren Fragen per Email unter piakabitzsch@web.de zu kontaktieren.

Mit freundlichen Grüßen,

Pia Kabitzsch

Einverständniserklärung

Ich benötige Ihr Einverständnis für die Teilnahme Ihres Kindes an der Studie. Bitte stellen Sie sicher, dass die unterschriebene Einverständniserklärung spätestens am Tag der ersten Testung am _____ im Hort vorliegt.

Name der Mutter/des Vaters: _____

Name des Kindes: _____

Geburtsjahr des Kindes: _____ Geburtsmonat des Kindes: _____

Ort und Datum _____ Unterschrift _____

Dieses Einverständnis können Sie jederzeit und ohne Angabe von Gründen widerrufen.