Learning and Individual Differences 65 (2018) 167–175

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

Reproducibility of young learners' susceptibility to the learning context

Inge Merkelbach[a,*], Rachel D. Plak[a,b], Ralph C.A. Rippe[a,b]

[a] Institute of Education and Child Studies, Leiden University, P.O. Box 9555, 3500 RB Leiden, The Netherlands
[b] Centre for Child and Family Studies, P.O. Box 9555, 3500 RB Leiden, The Netherlands

A B S T R A C T

Introduction: The current study tests if mild perinatal adversities imply increased susceptibility to quality of instruction in early literacy skills.
Method: In a large-scale experiment (N = 981) preschool children were randomly assigned to a digital intervention condition offering guidance and continuous feedback (*Living Letters*) or to a digital control condition that did not contain these features. Effects of the program on short- and long–term literacy outcomes were assessed; for the group as a whole and for children with and without differential susceptibility markers.
Results: No main effects of the intervention program were found for the group as a whole. Previous findings of susceptibility of children with mild perinatal adversities to *Living Letters* were not replicated. Further exploration of the data revealed, however, increased susceptibility in children born late preterm. Both directly after the intervention and a year later, children born late preterm outperformed their full term born peers if they had received *Living Letters* in kindergarten, but fell behind if they had received the control program.
Conclusion: An extra program that typically provides continuous guidance and feedback can benefit children born late preterm, but does not benefit children born full term. An increased level of stress reactivity is proposed to be the mechanism underlying the susceptibility to the program found in children born late preterm.

1. Introduction

Mild perinatal adversity is generally conceived as a vulnerability factor because of the well-established association between mild perinatal adversities and higher risk of learning problems (Van Baar, Vermaas, Knots, De Kleine, & Soons, 2009). As implied by the emerging notion of differential susceptibility, however, a so-called vulnerability factor may actually be a plasticity factor. Vulnerable individuals, such as children with mild perinatal adversities, may be more susceptible to qualities of instructional programs, for better and for worse. In a prior study, it was shown that children with mild perinatal adversities were at risk for early reading problems, but when their emerging alphabetic skills were stimulated by a computer program targeting these skills, these children reached a higher level of early reading skills compared to their non-risk peers, an advantage that remained a year later (Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, & Bonsel, 2012).

In the current study, we test the reproducibility of Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, and Bonsel's (2012) results and conclusions. In the Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, and Bonsel (2012) sample, there were only a small number of children with perinatal adversities (N = 21). It is important to examine the inferential reproducibility (Goodman, Fanelli, & Ioannidis, 2016) in other, preferably larger samples. The current study was part of an ongoing large-scale extensive experiment that took place in 172 Dutch schools for primary education. The primary aim of the large-scale study was to test a gene x environment interaction targeting genes related to the dopamine-system. With rather modest additional costs and efforts this experiment allowed for testing the reproducibility of the hypothesis that children with perinatal adversities were more susceptible to a program that offers guided practice to learn alphabetic skills, that is, to the *Living Letters* program, a computer-based remedial intervention with an adaptive feedback regime. The current study was similar to the study carried out by Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, and Bonsel (2012) except for small details of experimentation. The large sample guaranteed that sufficiently large numbers of pupils with low base rate perinatal adversities could be sampled and included in the experiment. It also allowed for examination of the effects of the Living Letters program on subsamples of children with perinatal adversity, specifically children born late preterm and children small for gestational age.

The current line of research was inspired by a study by Boyce et al. (1995), who found that biological reactivity makes children more sensitive to the context, both for better and for worse. That is, highly biologically reactive children who were in high-adversity childcare

* Corresponding author.
E-mail addresses: i.merkelbach@fsw.leidenuniv.nl (I. Merkelbach), r.d.plak@fsw.leidenuniv.nl (R.D. Plak), RRippe@fsw.leidenuniv.nl (R.C.A. Rippe).

https://doi.org/10.1016/j.lindif.2018.05.020
Received 31 May 2017; Received in revised form 21 April 2018; Accepted 26 May 2018
1041-6080/ © 2018 Published by Elsevier Inc.

settings or home environments had substantially higher illness rates than other groups of children, however biologically reactive children who were in more supportive childcare or family settings had the lowest illness rates. It may be that mild perinatal adversities lead to higher cardiovascular and HPA-axis reactivity to context, which, according to the pioneering study of Boyce et al. (1995), would make children more sensitive to context, for better and for worse. Due to heightened stress reactivity, children with perinatal adversities may easily shut themselves off from learning experiences, especially when those experiences are unstructured. The concept of biological reactivity, for better and for worse, can be applied to an educational context as well. For example during the preschool years, children learn alphabetic skills, but the learning is often unstructured. That is, rather than receiving systematic instruction, children learn through accidental events such as attempts to write their name or 'mama', a parent informally instructing letters or phonemic awareness saying "See that is the letter P from Peter", and so forth. However, it may be that biological reactive children would profit from systematic instruction in alphabetic skills. The target program, *Living Letters* provides such systematic instruction. *Living Letters* makes use of guided practice and provides continuous feedback, features that may be particularly helpful for children suffering from an increased biological reactivity to stress.

1.1. Perinatal adversity and academic performance

Both low birth weight and preterm birth have been associated with negative cognitive and academic outcomes later in life. Children who are small for gestational age at birth are found to have lower IQ-scores (Hutton, Pharoah, Cooke, & Stevenson, 1997; Sommerfelt et al., 2000) and poorer cognitive performance (Mccarton, Wallace, & Divon, 1996), and are at risk for developmental delays and language problems (Gutbrod, Wolke, Soehne, Ohrt, & Riegel, 2000). Compared to full term children, children born late preterm have twice the risk for enrollment in special education at all grade levels (Van Baar, Vermaas, Knots, De Kleine, & Soons, 2009), are at increased risk for developmental delays and school-related problems (Morse, Zheng, Tang, & Roth, 2009; Quigley et al., 2012), and are at increased risk for literacy problems or disabilities (e.g. Guarini, Sansavini, Fabbri, & Savini, 2010; Kirkegaard, Obel, Hedegaard, & Henriksen, 2006).

1.2. Perinatal adversity and stress

Being born (late) preterm is associated with dysfunctioning of the hypothalamic-pituitary-adrenal axis (HPA-axis) (e.g. Bolt, Weissenbruch, Lafeber, & Delemarre-Van De Waal, 2001; Buske-Kirschbaum et al., 2007). The HPA-axis controls the secretion of the stress-hormone cortisol (Kolb & Whishaw, 2009)) and may therefore be essential for coping with stress (Aisa, Tordera, Lasheras, Del Río, & Ramírez, 2007). The preterm group may easily feel stressed, and the stress may interfere with their ability to attend to information (Gotlib, Joormann, Minor, & Hallmayer, 2008). Hence, they may need external support to control extreme stress reactivity to the environment in order to benefit from a program such as *Living Letters* that provides guided practice and continuous feedback.

Being born small for gestational age has also been shown to be related to the functioning of the HPA-axis (e.g. Bolt, Weissenbruch, Lafeber, & Delemarre-Van De Waal, 2001). For instance, low-birth-weight babies showed increased cortisol concentrations in umbilical cord blood, and raised urinary cortisol excretion in childhood (Economides, Nicolaides, Linton, Perry, & Chard, 1988). In adult life, they have higher pulse rates, an index of sympathetic activity, and increased fasting cortisol concentrations (Phillips et al., 1998; Reynolds et al., 2001). Studies have shown an enhanced plasma cortisol response to synthetic adrenocorticotropic hormone (Levitt et al., 2000). Further, an increased stress response has been observed in low-birth-weight children (Phillips & Jones, 2006). Thus, *Living Letters*, may fit the needs of this subsample as well, because the program may help to control extreme stress reactivity to the environment.

1.3. Aims of current research

The main aim of the current study was to replicate and extend a previous small-scale prior experiment that demonstrated an increased susceptibility to a computer program, *Living Letters*, compared to a control program (*Living Books*) for a group of children with mild perinatal adversities (Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, & Bonsel, 2012). In the previous study, a large effect size was found for the susceptible group ($d = 1.5$, 84% $CI = 0.74, 2.15$), and a small effect size for the non-susceptible group ($d = 0.00$, 84% $CI = -0.33, 0.33$). We also examined the long-term effects of *Living Letters* using standardized tests assessing word recognition about one year later (i.e. rapid word reading). In the previous study, the effect size was large for the susceptible group ($d = 1.17$, 84% $CI = 0.44, 1.8$) but small for the non-susceptible group ($d = -0.04$, 84% $CI = -0.40, 0.31$). Lastly, we extended the previous research by examining effects separately for children who were small for gestational age and children who were born late preterm.

2. Method

2.1. Design

The purpose of this study to replicate the small-scale study carried out by Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, and Bonsel (2012), but with a larger sample size. We thus designed the study to similar to the previous study, with some small changes had due to the larger sample size. The current study used data collected in two successive research waves (2013–2014 and 2014–2015) in which in total 147 different Dutch schools participated. In 2013, the experiment was carried out at 57 schools. Teachers selected, with the help of a commonly applied standardized test (*Cito Kindergarten Test*), children who were delayed in basic knowledge skills essential for learning to read. Children were randomly assigned children from within classroom to different treatment conditions, as proposed in (Parker, 1990). A similar rigorous procedure was followed a year later with 118 schools, resulting in a total of 981 participants across both research waves. There was only a small overlap of schools between the two waves ($k = 28$ schools). The short-term post-test was a digital literacy test designed by the researchers. The test included three subtests, and was administered individually and computer-assisted by the teacher. The long term post-tests were standardized literacy tests that are commonly administered to first graders in the eighth month of school. The tests target beginning word reading (accuracy and rate).

2.2. Participants

Based on the 20% perinatal adversities in the prior experiment (Van der Kooy-Hofland, Van der Kooy, Bus, Van IJzendoorn, & Bonsel, 2012), we estimated that a sample of 450 children might include approximately 90 children with perinatal adversities. A sample this large would allow for examination of low birth weight children and preterm children separately. The initial sample for the current study consisted of 981 five-year-old children. Participants were excluded from analysis due to missing pretest or posttest information or incomplete perinatal information (see flow diagram in Fig. 1). Two children born (very) preterm (before 34 weeks of pregnancy) were also excluded from analyses. The final sample consisted of 439 children from 147 different schools. Of these children, 55 children were born late preterm and 102 were small for gestational age at birth. The 55 children born late preterm were from 44 different schools. None of the participating schools provided more than three children born late preterm to the final sample. The 102 children who were small for gestational age at birth

Download English Version:

https://daneshyari.com/en/article/6844321

Download Persian Version:

https://daneshyari.com/article/6844321

Daneshyari.com