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Support from Birth: ZEPPELIN 0-3 and Follow-Up ZEPPELIN 5-8

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ZEPPELIN² is one of the largest longitudinal intervention studies in Europe with a randomized controlled trial study design: Using the Parents as Teachers (PAT) program, parent educators made home visits to support young children in 132 families with social burdens every 2 to 3 weeks from birth to age three. The children are being compared to young children in 116 families who are not receiving PAT program support. The aim is to test whether early support from birth is effective in families that are in difficult circumstances.

The main research questions are:

1. Does the early support have positive impacts on the children's development?
2. Do the parents show improved parenting practices?
3. Do the families become more socially integrated?
4. Do children receiving support from the PAT program have greater school success than children not receiving PAT?

At the present (April 2021), the results of the first three years of the study and more recently of the first follow-up (Kindergarten and the 1st primary level) are available. The children of the ZEPPELIN-sample are attending 3rd grade at the current time, with ongoing data collection.

The first three questions can be answered positively in terms of proven effectiveness (see below). The fourth question - i.e. whether early support increases educational opportunities in the longer term - can only be answered after the evaluation of the results from the 3rd primary school year (the data will be available in Spring 2023) and later on in the transition to lower secondary education (2023-2025).

Target group: ZEPPELIN is interested in families that are in difficult circumstances around the children's birth and need support with early care and education of their children. 'Difficult circumstances' are given when the families have burdens and risk factors that make the start of parenthood particularly difficult, such as limited social support, financial distress, unemployment, or family difficulties. Here are some data from the sample:

At the beginning of the research project, out of the 248 participating families from Canton of Zurich, Switzerland, 73% of mothers do not have Swiss citizenship, 31% spoke no or very little German at recruitment, which made the deployment of intercultural translators necessary. 14% of the children were born prematurely, 10.6% were born weighing less than 2,500 grams, and 5.2% are twins (Neuhauser, Ramseier, Schaub, Burkhardt, Templer & Lanfranchi, 2015).

According to data from the federal office of statistics, the sample contains more children born prematurely (14% vs. 7.3%) and more children with low birth weight (10.6% vs. 6.1%) compared to the Swiss average. The socioeconomic status - conceptualized as Socio-Economic Index of Occupational Status (ISEI) - is lower than in every Program for International Student Assessment (PISA), namely 35 compared to 55 points, according to the example of the Swiss special evaluation in 2012.

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Early support: Early support by the PAT program was implemented in several communes in the Canton of Zurich (near the project locations Dietikon/Schlieren, Opfikon/Kloten, and Dübendorf/Uster). The families received at-home support from a qualified and experienced parent educator, in most cases starting shortly after the birth of the child (and in 5% of the cases, starting even before the birth of the child), continuing up to the child's 3rd birthday. In addition, group meetings were held monthly at the family center. All PAT parent educators completed training in how to implement PAT and had regular coaching and supervision. For information on the necessary prerequisites and conditions for PAT, see <http://www.pat-miteltlernlernen.org/umsetzung/voraussetzungen/> or <https://parentsasteachers.org/essential-requirements>.

Research: To examine the effectiveness of the early support, the families were randomly assigned to two groups: an intervention group receiving the PAT program and a control group with no intervention. Comparison of the two groups aims to uncover the effect of the early support.

A) Main Results at Project End ZEPPELIN 0-3 (2012-2016)

Sample: Out of 248 families (IG=132, CG=116) and by the 4th measuring time (when the children were 3 years old), 31 families dropped out due to relocation, lack of time and illness. The loss of participants was thus less than 5% per year and smaller than in comparable studies with PAT conducted in Germany for example.

Child's development:³ The greatest impacts were found in the children's *language, cognition, and behavior* (Bayley-III, SBE-KT, CBCL). Children receiving PAT support showed significant advances compared to children in the control group; they possessed a larger vocabulary, were less anxious and slept better through the night (health questionnaire). Experiments on delayed gratification showed that children receiving PAT support had *better impulse control*.

Parenting practices: The analyses indicated that parents in the IG support their children more effectively in regard to fostering a *more stimulation environment at home* (HOME-inventory) compared to parents in the CG. Further, mothers receiving PAT were significantly *more sensitive in their interactions with their children* (CARE-Index) than mothers not receiving PAT after one year of the intervention, which in addition positively mediates the intervention effect on children's language development two years after the intervention.

Social integration: Parents receiving PAT support were better connected to community resources (*Soziale Netzwerke*). For instance, they utilized toy lending libraries as well as traditional libraries significantly more frequently than families in the CG.

B) Substudy Epigenetic Markers associated with Early-Life Stress

In cooperation with the Department of Psychology at the University of Zurich, the effect of stressful family context and the early support program PAT on biological changes were investigated in a subsample in ZEPPELIN (IG=72, CG=60). In the saliva of the then three-year-old children, the methylation level of the glucocorticoid receptor NR3C1 was measured, which represents an epigenetic marker for stress in early-life and was found to be associated with an increased risk for behavioral problems and psychopathology in adulthood. PAT has shown a positive effect in this regard: the analysis demonstrated an increase of the NR3C1 methylation level due to parental conflict and parental depressiveness, which however was smaller in PAT children than in the CG-children. This can be interpreted as a more positive prognosis regarding the mental health of PAT children (Gardini et al., 2020).

³ For all analyses, we checked whether the impacts found are not erroneously attributable to the variables child's gender, child's birthweight, mother's ability to speak German, and family burdens.

C) Main Results Follow-Up ZEPPELIN 5-8 (2017-2020)

Sample: There were 95 dropouts in total by the end of 2020 due to relocation and lack of time (at t7, the sample included 153 families). The sample attrition is comparable for IG and CG and thus amounts to 38% for 7 years of study. By international standards, the participation in ZEPPELIN remains high.

Child development: The positive effects of PAT found at the end of the intervention at age 3 is found again in Kindergarten regarding language skills (Sprachgewandt). Also in other developmental areas, the IG children show positive attributes (e.g. less problem behavior in CBCL, better impulse control in experiments). Kindergarten teachers also report less emotional problems in the 6-years-olds in the IG. Further, there are positive effects regarding mathematical skills (WILMA), but not in intelligence (SON-R). In the 1st primary school year, first preliminary analyses indicate further positive effect (only marginally significant) of PAT on math performance (WLLP-R). These results need to be examined in more detail, with control variables taken into accounts, which will be done by August 2021.

Parenting competences: The positive effects found at the age of 3 related to home stimulation (HOME) are also evident at the age of 5 and 6: IG-parents offer their children a *more stimulating learning environment* than the CG-parents, and also, their *parenting behavior* (APQ) is more positive.

Additional intervention group: A new intervention in form of five group meetings was designed and implemented as additional support and preparation for school enrolment and with the aim to strengthen learning success in 1st and 2nd grade: '*Lernort Familie 5+*'. In order to be able to differentiate between the effects of the early support and the new intervention, a new intervention group (KIG) with at-risk families was recruited ($n=97$), participating exclusively in *Lernort Familie 5+*. However, due to the low participation rate of parents from the IG and a high number of parents who dropped out of this additional intervention support during the Corona pandemic, the planned analyses of effectiveness could not be conducted with the necessary power. This also confirms past findings that center-based interventions ("*Komm-Strukturen*") represents a higher threshold for burdened parents to participate in. In other words, a high level of participation, as achieved in ZEPPELIN with the PAT home visit program, is de facto only possible with home-based interventions ("*Geh-Strukturen*").

Selected Research Outputs, by year of publication:

- Lanfranchi, A. & Neuhauser, A. (2013). ZEPPELIN 0-3: Theoretische Grundlagen, Konzept und Implementation des frühkindlichen Förderprogramms „PAT –Mit Eltern Lernen“. *Frühe Bildung*, 2 (1), 3-11
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- Jungmann, T., Sierau, S., Dähne, V., Serbati, S., Dugravier, R., & Lanfranchi, A. (2017). Effectiveness of four early intervention programs in Europe: How do the results inform program development and dissemination? *Nursing and Health Sciences*, 3(3), online: <http://www.rroij.com/open-access/effectiveness-of-four-early-intervention-programs-in-europe-how-do-the-results-in-form-program-development-and-dissemination-.php?aid=86357>
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- Schaub, S., Eberli, R., Ramseier, E., Neuhauser, A., & Lanfranchi, A. (2021). Langzeiteffekte früher Förderung in psychosozial belasteten Familien. *Schweizerische Zeitschrift für Bildungswissenschaften*, im Druck.
- Lanfranchi, A., Neuhauser, A., Schaub, S., & Ramseier, E. (2021). *Die longitudinale Studie ZEPPELIN – Förderung ab Geburt zur Erhöhung der Bildungschancen von Kindern aus belasteten Familien*. Zürich: Interkantonale Hochschule für Heilpädagogik, im Druck (e-book), Forschungsbericht F&E für das Jubiläum „20 Jahre HfH“.

Key Data of the ZEPPELIN Intervention Study

- Longitudinal study (2011 to 2033): Main Study ZEPPELIN 0-3, Follow-ups 5-8, 9-13, 15-16, 20.
- Target group: Families with social burdens and with a newborn child
- Main aim: Early support for enhanced educational opportunities in the long term
- Intervention: Parent education at home using the Parents as Teachers (PAT) program
- RCT design; N at t_0 (baseline) = 248 families with 261 children (intervention group = 132 families; control group = 116 families)
- 9 measurement time points so far: t_0 : (3rd month of life), t_1 (1st year of life), t_2 (2nd year of life), t_3 (3rd year of life), t_5 (1st Kindergarten), t_6 (2nd kindergarten), t_7 (1st primary school), t_8 (Family), t_9 (3rd primary school).

Support Program: Parents as Teachers (PAT)

- A parent advisor with special training (PAT parent educator) makes regular at-home visits to 12 families (every 2 to 3 weeks for 3 years)
- Group meetings are held once a month at the family center
- The building of social connections in the local community is intensively pursued
- PAT parent educators conduct development screenings
- At program end, utilization of further resources such as Kita (day care centre), Lernort Familie 5+ etc. is set up

Conclusion for practice

The prevention program Parents as Teachers (PAT) is especially well suited for providing effective and long-lasting developmental support to children in families with social burdens.

The challenge is the correct identification of at-risk families as well as obtaining and maintaining their motivation to participate in an intensive program such as PAT.

The standard of quality to successfully reach “hard-to-reach” families consists of the following points:

- Connection to existing facilities in the early support sector (such as maternal and paternal counselling)
- Establishing interdisciplinary networks “around the birth” (with professionals from the medical- and psychosocial field, such as paediatricians, midwives etc.)
- Usage of short screening procedures to initially assess family risk- and protective factors
- Persistence and patience if the first contact attempts fail – and to pay the families a visit at home, if necessary with the help of intercultural translators.
- Provide incentives for parents to join the program as well as to stay in it (little welcome gifts, birthday gifts, e.g. a game or picture book)

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