

THE TRANSITION FROM PRE-SCHOOL TO SCHOOL CAN BE SUPPORTED BY ENHANCING (PRE-)COMPETENCES (NIESEL & GRIEBEL, 2013; KLUCZONIK & ROSSBACH, 2008). FOSTERING COMPETENCES IN PRE-SCHOOL CAN BE REALIZED BY USING STANDARDIZED PROGRAMS. BUT THESE PROGRAMS ARE OFTEN DIFFICULT TO IMPLEMENT IN EVERYDAY LIFE (PETERMANN, 2015; JÖRNS ET AL., 2014). AN ALTERNATIVE APPROACH IS EMBEDDED INSTRUCTION WHICH HAS NOT YET BEEN WELL RESEARCHED IN GERMANY (JÖRNS ET AL., 2014; GASTEIGER, 2012).

EMBEDDED INSTRUCTION

- Embedded instruction is defined as implementation of child-initiated and teacher-mediated support activities in everyday life (Rakap & Parlak-Rakap, 2011)
- Embedded instruction is an effective approach to teach different skills, especially to pre-schoolers with disabilities or developmental risks (Jörns et al., 2014; Rakap & Parlak-Rakap, 2011)
- For embedded instruction, material and media are used which are part of everyday life in the institution (Jörns et al., 2014; Koch et al., 2015; Rakap & Parlak-Rakap, 2011)
- Storybooks are suitable for embedded instruction in Kindergarten (Koch et al., 2015; Albers, 2015; Petrill et al., 2014) and for enhancing mathematical and numerical skills (Koch et al., 2015; Benz, 2012; 2008; Gasteiger, 2012; Tiedemann, 2012; van den Heuvel-Panhuizen & Boogaard, 2015; 2012; 2009; 2008)

MATHEMATICAL PRE-COMPETENCES

- Mathematical pre-competences are defined as competences which are required for deeper mathematical understanding and preparation for mathematics in school (Ennemoser & Krajewski, 2015; Benz et al., 2014; Krajewski & Schneider, 2006)
- The number-quantity-connection model (Krajewski & Ennemoser, 2013) describes the development of mathematical pre-competences on 3 levels:
 1. **Basic competences:** Quantifiers & numerics bear no relation to quantities and sizes
 2. **Simple understanding of numbers:** Linking quantifiers and numerics with quantities and sizes
 3. **Deeper understanding of numbers:** Linking quantifiers and numerics with amount-relations and size-relations (number relations)

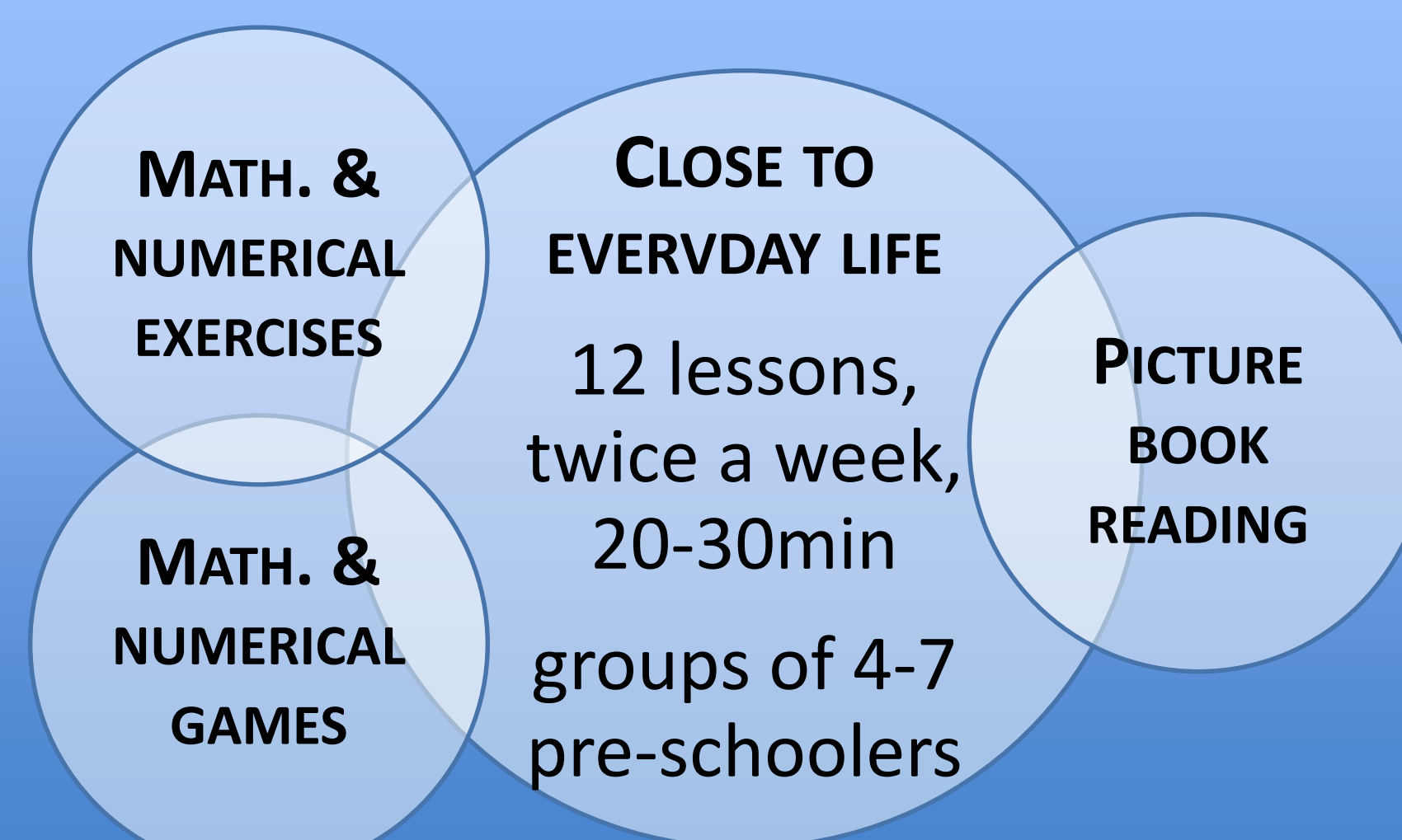
DO PRE-SCHOOLERS' NUMERICAL SKILLS AND MATHEMATICAL PRE-COMPETENCES IMPROVE FOLLOWING AN INTERVENTION IN KINDERGARTEN USING PICTURE BOOKS?

Design

	Pre (t1)	Intervention	Post (t2)
Experimental group	BIKO 3-6 IDS 5-10 CFT-1R VSK	X	BIKO 3-6 IDS 5-10 VSK
Control group	BIKO 3-6 IDS 5-10 CFT-1R VSK	(motoric offer)	BIKO 3-6 IDS 5-10 VSK

BIKO 3-6 (Souvignier et al., 2014) → Scales: numerical basic competences (MBK-0) & linguistic competences (HASE)
IDS 5-10 (Grob et al., 2009) → Scale: logical-mathematical thinking
CFT-1R (Weiß & Osterland, 2012) → cognitive capacity
VSK (Koglin & Petermann, 2016) → social & emotional competences

Intervention

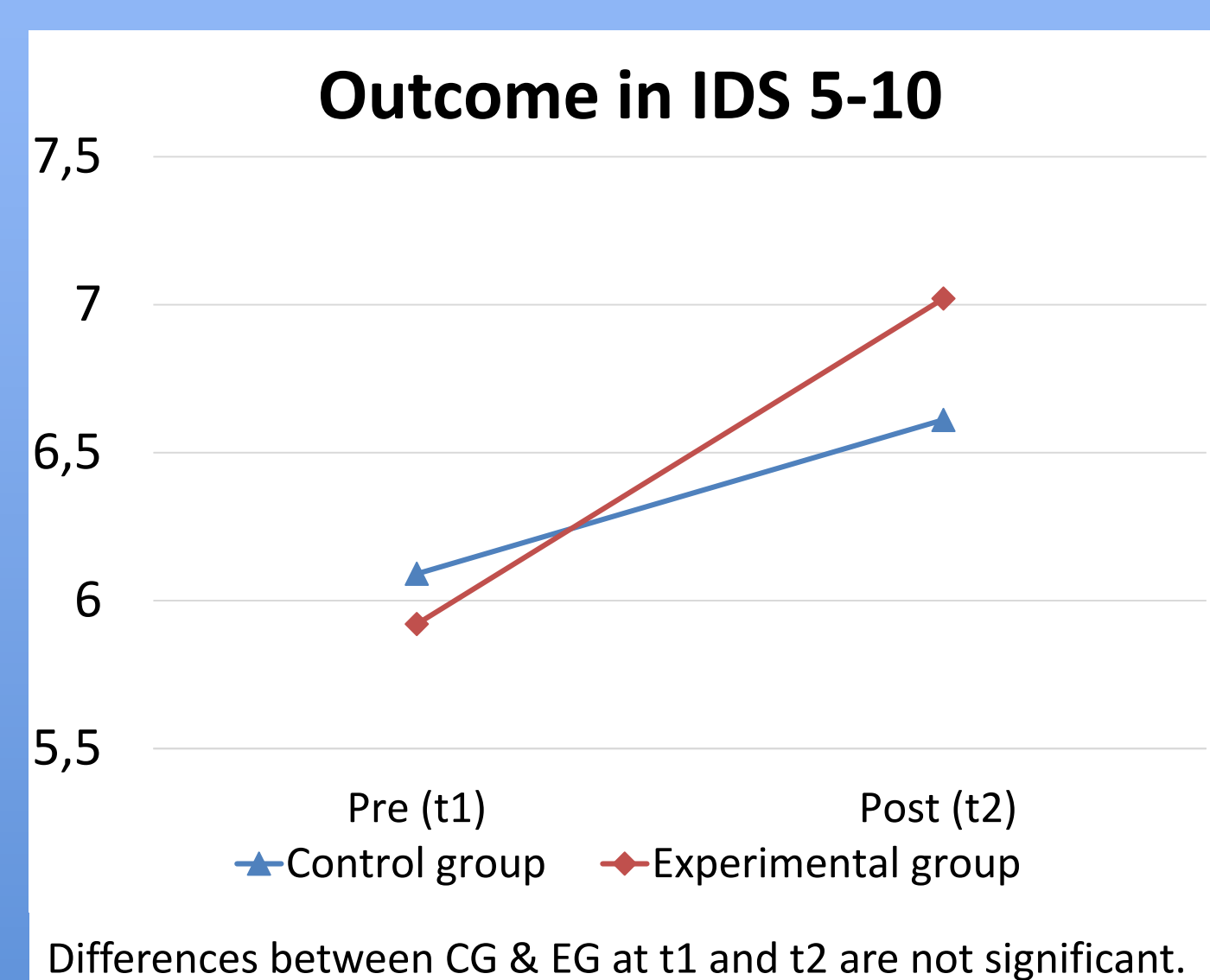
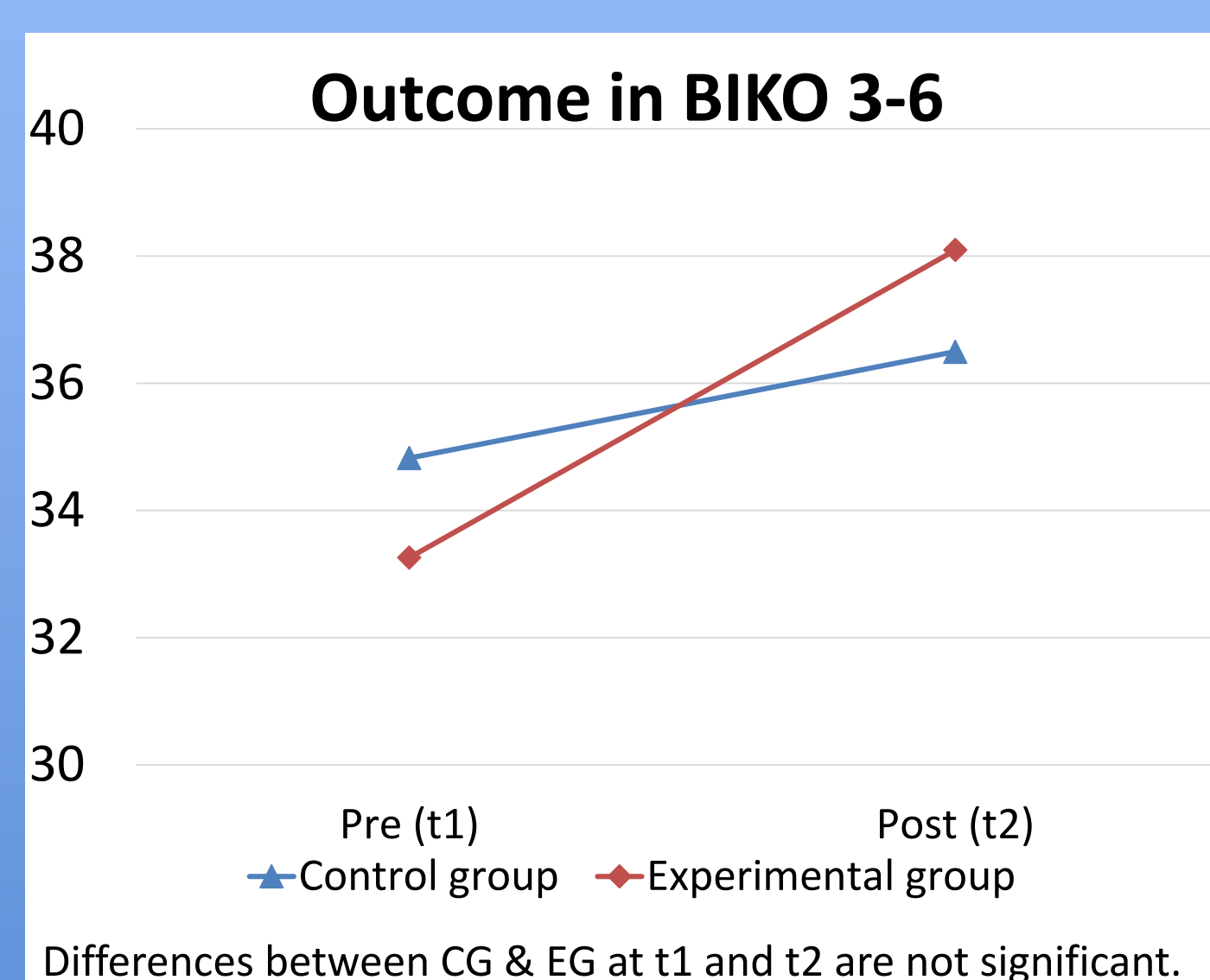


Sample

	All	Sex		Ø Age	Ø IQ	Dropout Δt ₁ -t ₂
		N male	N female			
Experimental group	108	59	49	6,0	96,3	5,45%
Control group	100	49	51	6,0	96,6	2,0%
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Results

- Significant performance improvement in the EG after having passed the intervention (BIKO 3-6 $d_{corr}=.73$; IDS 5-10 $d_{corr}=.46$)
 - better mathematical outcome in both measuring instruments
 - better mathematical outcome on level 1 ($d_{corr}=.54$) and 2 ($d_{corr}=.55$) of Krajewski's number-quantity-connection model



- Focus on children with developmental risks:
 - **Children with a below average IQ (IQ<85):**
The differences between the performance improvement of EG_{IQ<85} and the CG_{IQ<85} in BIKO 3-6 ($d_{corr}=1.09$) and IDS 5-10 ($d_{corr}=1.02$) are significant.
 - **Children with below average linguistic competences (T<40):**
The difference between the performance improvement of EG_{T<40} and CG_{T<40} in BIKO 3-6 is significant ($d_{corr}=1.14$). The difference between the results of the IDS 5-10 is not significant.
 - **Children with below average social competences (T<40):**
The difference between the performance improvement of EG_{T<40} and CG_{T<40} in BIKO 3-6 is significant ($d_{corr}=.97$). The difference between the results of the IDS 5-10 is not significant.

Discussion & Implications

- The intervention is able to strengthen mathematical pre-competences.
- The children of the experimental group overtook the control group after having passed the intervention (t2). They were able to catch up.
- Children with developmental risks profit from the intervention as well (see also results of Rakap & Parlak-Rakap, 2011).
- Further research is needed:
 - Follow-up measurements to analyse the long-term effects of the intervention
 - Research on the use of the handbook implemented by preschool teachers (in "real embedded instruction situations")
 - Effects of embedded instruction in pre-school in general