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Problem statement

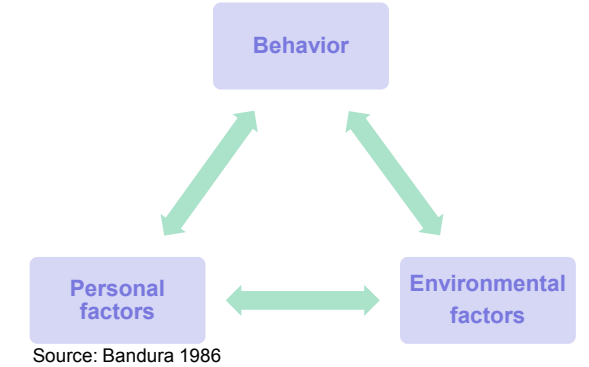
- Fruit and Vegetable (F&V) consumption**
 - can lower the risks of chronic diseases (e.g. Buijsse et al. 2009).
 - falls considerably below the minimum intake of 5 servings F&V per day (WHO 2003).
 - amounts to less than 2 servings per day for 70% of children in Germany (Mensink et al. 2007).
- F&V intervention in schools**
 - are seen as an effective instrument for improving F&V intake by children (e.g. Howerton et al. 2007).
 - have been introduced in the EU in 2008 (European School Fruit Scheme (SFS)).
 - started in 355 elementary & special-need schools in North Rhine-Westphalia (NRW; Germany) in 2010.

Introduction

Theoretical background

- Nutrition behavior is a complex construct with multiple interdependencies (e.g. Glanz and Bishop 2010).
- Personal, behavioral and environmental factors influence children's dietary behavior (e.g. Bandura 1998; see F1).
- Interventions with a multi-component approach are most promising to positively affect nutritional behavior (Van Cauwenberghe et al. 2009).

F1: Theoretical framework



Research objectives & Study design

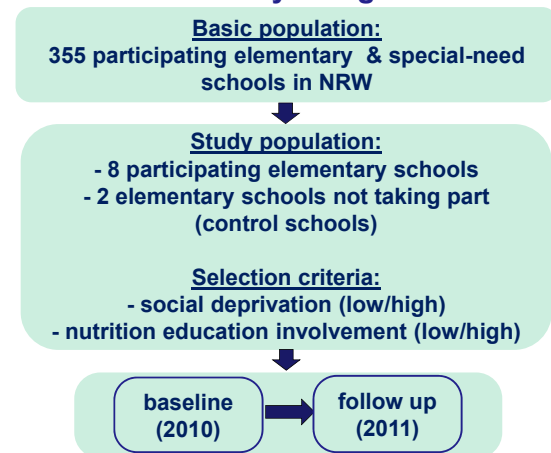
Research objectives

- Analyse the acceptance of the SFS in NRW.
- Examine the scheme's impact on children's total F&V intake frequency.
- Identify potential influencing factors.

Study design & Study population

- Multi-component study with a pretest and after 1 year of intervention-start design including intervention and control group (see F2).
- Children and teachers were interviewed.
- n=499 children, 2010: 2nd & 3rd graders; 2011: 3rd & 4th graders.
- Teachers at follow up (2011).

F2: Study design



Methodology & Data

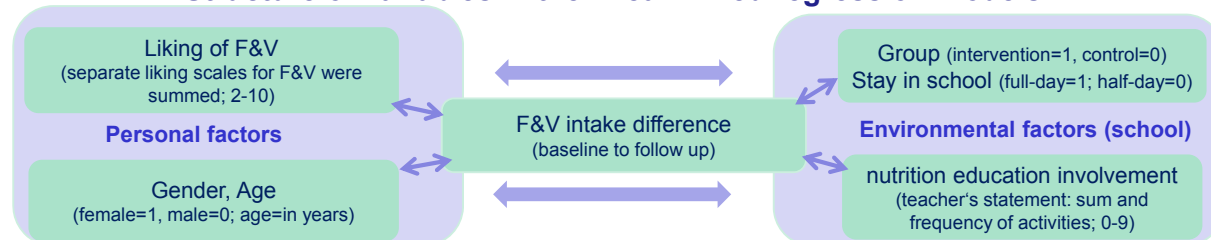
Questionnaires

- Children:**
 - 1st part: 24h food recall filled in as a whole class exercise, developed within the scope of "Grab 5 Project" in the UK (Edmunds and Ziebland 2002) and adjusted for this study (see F3).
 - 2nd part: questions concerning knowledge, attitudes and beliefs.
- Teachers:**
 - Questions about organization, assessment of the program and accompanying nutrition education measures.

Analysis

- F&V intake frequency per day was counted, based on the 24h food recall (follow up included SFS F&V).
- Potatoes, F&V juices and most of the combination foods were excluded.
- Wilcoxon rank-sum test was conducted to identify the difference in F&V consumption between baseline and follow up.
- To detect and control for potential influencing factors of the intervention three mixed linear regression models were estimated (see F4).

F4: Structure of variables in the linear mixed regression models

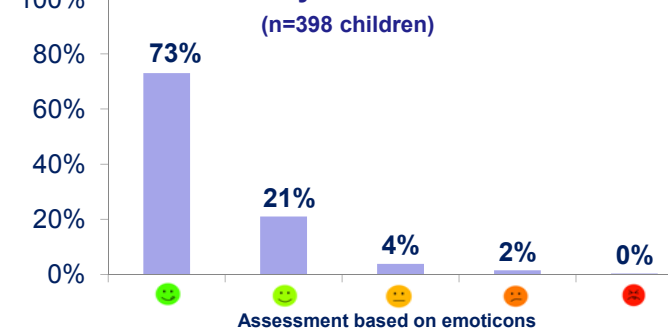


F3: 24h recall, first page



Results

F5: How do you like the SFS? (n=398 children)



T1: F&V consumption frequency – baseline and follow up

Group	Baseline	Follow up
Intervention		
- I. overall (n=390)	1,26	2,02 ***
- II. lower baseline intake (0-1x) (n=257)	0,44	1,77 ***
- III. higher baseline intake (>1x) (n=133)	2,85	2,50 **
Control		
- I. overall (n=109)	1,31	1,18
- II. lower baseline intake (0-1x) (n=70)	0,50	0,71
- III. higher baseline intake (>1x) (n=39)	2,77	2,03 **

Data presented in unadj. means; Wilcoxon rank-sum test; Significance: ***p ≤ 0,01; **p ≤ 0,05

T2: Factors influencing the change in F&V intake between baseline and follow up (Mixed linear regression models)

Independent variables	Model I overall Coeff. (Stand. Err.)	Model II lower baseline intake Coeff. (Stand. Err.)	Model III higher baseline intake Coeff. (Stand. Err.)
Constant	-1,22 (1,03)	-2,40 (0,94) **	-0,77 (1,92)
Group	0,91 (0,21) ***	1,12 (0,20) ***	0,45 (0,32)
Age	0,09 (0,10)	0,13 (0,09)	0,03 (0,18)
Gender female	0,13 (0,15)	0,31 (0,14) **	0,40 (0,28)
Stay in school (half-day/full-day)	0,21 (0,17)	-0,09 (0,15)	0,46 (0,31)
Nutrition education	0,0003 (0,0002)	0,0002 (0,0002)	0,0005 (0,0003)
Liking of F&V (at baseline)	0,003 (0,05)	0,15 (0,04) ***	-0,09 (0,10)
Wald Chi ² (6); (Prob>chi ²)	24,54; (0,0004)	58,29 (0,0000)	9,98 (0,1255)

Data nested in classes (34); Significance: ***p ≤ 0,01; **p ≤ 0,05

- The SFS in NRW is highly accepted by the children (see F5).
- In general children show a very low F&V consumption frequency well below the recommendation at baseline (see T1).
- Intervention group:
 - significant positive effect in total F&V consumption frequency per day.
 - however, significant increase only for children with a low F&V intake frequency at baseline (see T1 & T2).
- Gender (girls) and liking of F&V are positively associated with a higher increase (see T2).

Conclusions

- There are few studies that measure young children's F&V consumption through self-reporting.
- Using a validated questionnaire, an intervention effect (change in F&V intake frequency) could be detected.
- Although multi-component intervention studies are known to advance intervention's success, nutrition education on class level shows no significant impact.
 - Possibly there is a general estimation problem resulting from the small and unbalanced number of individuals on class level.

References

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