European School Fruit Scheme in North Rhine-Westphalia (Germany) – Does it work?

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Introduction

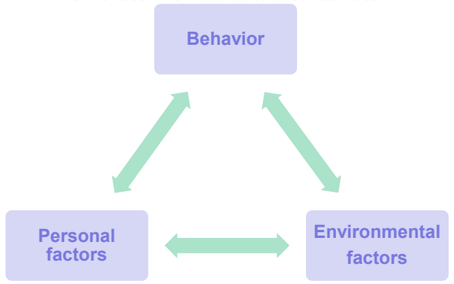
Problem statement

- **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.

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 promosing to positively affect nutritional behavior (Van Cauwenberghe et al. 2009).

F1: Theoretical framework



Source: Bandura 1986

Research objectives & Study design

Research objectives

1 Analyse the acceptance of the SFS in NRW.
2 Examine the scheme's impact on children's total F&V intake frequency.
3 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

Basic population:
355 participating elementary & special-need schools in NRW

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Study population:
- 8 participating elementary schools
- 2 elementary schools not taking part (control schools)

Selection criteria:
- social deprivation (low/high)
- nutrition education involvement (low/high)

↓

baseline (2010) → follow up (2011)

Methodology & Data

Questionnaires

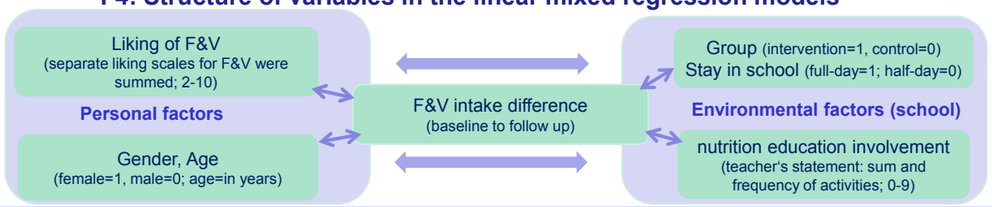
- **Children:**
  1st part: 24h food recall filled in as a whole class exercise, developed within the scope of "Grab 5 Project" in the UK (Edmunds and Ziebland 2002) and adjusted for this study (see F3).
  2nd part: questions concerning knowledge, attitudes and beliefs.
- **Teachers:**
  Questions about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

F3: 24h recall, first page

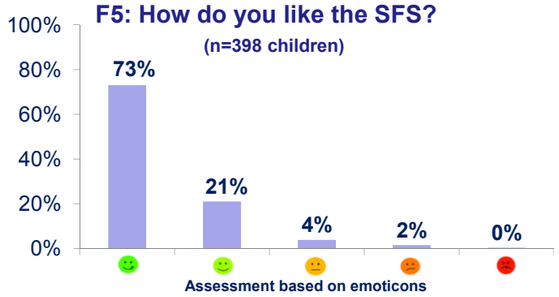
F4: Structure of variables in the linear mixed regression models



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 runk-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

Bandura A (1986): Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, N.J.: Prentice-Hall.
Bandura A. (1998). Health promotion from the perspecrtive of social cognitive theory. *Psychology & Health*, 13 (4):623-649.
Buijsse, B., Feskens E.J.M, Schulze, M.B, Forouhi N.G, Wareham, N.J, Sharp, S., Palli, D., Tognon, G., Halkjaer,J., Tjønneland, A., Jakobsen. M.U., Overvad, K., van der A, D.L., Du, H., Sørensen, T.I.A. and Heiner Boeing (2009). Fruit and vegetable intakes and subsequent changes in body weight in European populations: results from the project on Diet, Obesity, and Genes (DIOGenes). *American Journal of Clinical Nutrition*, 90 (1): 202-209.
Edmunds L. D. and Ziebland S. (2002). Development and validation of the day in the life questionnaire (DILQ) as a measure of fruit and vegetable questionnaire for 7-9 year olds. *Health Education Research – Theory & Practice*, 17 (2): 211-220.
Glanz K. and Bishop D. B, (2010). The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions. *Annual Review of Public Health*, 31:399-418.
Howerton, M.W., Bell, S., Dodd, K., Berrigan, D., Stolenberg-Solomon, R., and L. Nebeling (2007): School-based Nutrition Programs Produced a Moderate Increase in Fruit an Vegetable Consumption: Meta and Pooling Analyses from 7 Studies. *Journal of Nutritional Education Behaviour*, 39: 186-196.
Mensink G. B. M., Heseker H., Richter A., Stahl A., Vohmann C. (2007). Ernährungsstudie als KiGGS-Modul (EsKiMo). Forschungsbericht im Auftrag des BMELV, September 2007.
Van Cauwenberghe E., Maes L., Spittaels H., Van Lenthe F. J., Brug J., Oppert J.-M., De Bourdeaudhuij I. (2010): Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. *British Journal of Nutrition*, 103: 781-797.
World Health Organization (WHO, 2003). *Diet, nutrition and the prevention of chronic diseases*. Report of a Joint FAO/WHO Expert Consultation, WHO Technical ReportSeries, No. 916. Geneva.

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