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**Author:** Berg, Heleen van den

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# Chapter

# 4

## **Why Parents are Attracted to the Low-Dosage Intervention BookStart**

## Abstract

Parents of newborn babies are not only responsible for their baby's physical well-being but also for their cognitive development. BookStart provides parents with materials and, if wished, advice on book sharing with babies, in order to enhance a baby's language level. The current study included 70 randomly selected parents, some of whom ( $n = 21$ ) participated in BookStart while the rest did not. The aim was to examine whether the participants included those parents for whom BookStart could be a crucial intervention. Results show that parents of temperamentally reactive babies were five times as likely to participate in BookStart than parents of less reactive babies. A subsample of parents ( $n = 38$ ), who were willing to register all verbal input during one day, revealed that abnormalities in actual language input predict participation in BookStart. Both effects were found after we controlled for educational level of the parent, number of children in the family, library membership of the parent, and BookStart library in the municipality.

*Based on:*

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Verbal interaction with babies from a very early age is important for cognitive development. In particular, book sharing can give a boost to the baby's language development (e.g., Rodriguez, Tamis-Lemonda, Spellmann et al., 2009). Parental talk during book sharing is much more complex than talk during play, even when the book only contains single or multiple word fragments as in baby books (e.g., Cameron-Faulkner & Nobles, 2013). The effects of BookStart - a low-dosage book reading intervention initiated in 1992 in Birmingham, England, and adopted in 2008 in the Netherlands - corroborate the importance of an early start with book sharing. In a nutshell our evaluation of BookStart indicates that if parents complied with the BookStart suggestion to start book sharing at around 8 months, children's vocabulary benefited at 15 months (van den Berg & Bus, submitted). At 22 months, the word gap between both groups had increased, probably due to snowballing (Mol & Bus, 2011). Findings thus provide evidence for a causal relationship between an exogenous stimulus promoting an early start with book sharing, BookStart, and children's language development.

A worst case scenario would be that those parents least in need of an intervention - like highly educated parents - are the most inclined to accept the invitation to participate in the BookStart project, because they are by nature attracted to activities like book sharing and other verbal activities (e.g., Griffin & Morrison, 1997; Kuo, Franke, Regalado, & Halfon, 2004; Raikes, Pan, Luze et al., 2006; Westerlund & Lagerberg, 2008), while parents who are most in need of BookStart may not participate (Vanobbergen, Daems, & Tilburg, 2009). BookStart should particularly appeal to parents when the intensity and quality of parent-child interaction is deficient. If parents have problems initiating verbal interaction with their baby and the child often responds in a negative manner, this should be a reason for participating in BookStart. To attract parents urgently in need of tips and tricks to improve verbal interaction with the baby, the BookStart invitation includes sentences like: *'Did you know that you can already read small books with your baby?'* and *'Looking at pictures together and talking or singing together is good for the contact with your baby and for the language development of your child'* (Weisleder & Fernald, 2014).

The main aim of this study was to test whether those parents who really need to use BookStart actually participate in BookStart. We therefore tested whether parents tend to participate more when they perceive the baby's responses in interactive situations as being problematic. According to their scores on the Infant Behavior Questionnaire (Rothbart, 1981), these parents characterize their baby as more irritable during activities as hair washing, bathing, eating, and drinking. It seems plausible that in these families verbal interactions might differ from those in other families, that is,

either parents ignore the child, if possible, or they try to comfort their child, often without success. A previous study (van den Berg & Bus, 2014) showed that parents report low levels of significant verbal interaction with their children when the babies are highly irritable. As a result, parents might have developed negative feelings about their parenting skills (e.g., Banerjee & Tamis-LeMonda, 2007; Machida, Taylor, & Kim, 2002; Usai, Garelllo, & Viterbori, 2009) and are more in need of support than parents of easy-going babies when enhancing positive parent-child interaction.

### **This study**

In this chapter our aim was to test whether the invitation to participate in BookStart appeals to those parents who are most in need of support because of the problems they experience in interacting with their reactive child. We tested both the effects of scores on a temperament scale (that is, whether parents perceive their child's behavior during daily activities as problematic) and also effects of the actual frequency and quality of verbal interaction between parent and child during a normal day.

Other obvious factors may affect participation in BookStart and were included as covariates in this study. As less educated parents may not value verbal interaction with their baby to the same extent as highly educated parents, they may be less concerned when they are not successful in involving their child in verbal interaction. BookStart may therefore be less effective at reaching less educated parents than highly educated parents as a result of which BookStart may be less effective in preventing a word gap compared to projects that offer direct coaching of parents most in need of the intervention.

We also controlled for other obvious factors as library membership of the parent and number of children. It seems plausible to presume that parents are more inclined to participate in BookStart when they have a library membership and come across BookStart materials during their visits to the library or when they have received an invitation from the municipality to collect a BookStart case at the library (Birckmayer, 2001; Neuman, 1996). Parents may also be more eager to optimize their behavior and more inclined to participate in BookStart with firstborn children. There is evidence that parents talk more to their firstborn child than to their other children (Gilkerson & Richards, 2009).

In sum, we tested the following hypotheses:

1. BookStart may be particularly attractive to parents when they characterize their children as showing high levels of negative emotionality and when verbal interaction with the baby is perceived as challenging by parents.
2. In the same vein, BookStart may appeal more to parents when actual verbal

interaction in the home is limited or, on the contrary, very intense, mainly to comfort their baby. In other words, extremely low or high scores on parent-child verbal interaction predict participation in BookStart.

3. We need to control for background variables that also affect participation in BookStart such as living in a BookStart area, library membership of parents, number of children, and parental educational level.

## Method

### Design

We recruited parents via well-baby clinics when children were six to nine months. Ninety-five percent of the babies attend in their first year (Actiz, 2014). To avoid the sample being positively skewed towards highly educated parents, we asked parents questions about background variables. Based on their education level we randomly selected 70 parents for participation in the study (about 25 parents per level: low-educated, middle-educated, and high-educated). Roughly equal numbers of parents were invited from BookStart and non-BookStart areas. During the home visit that took place when the child was on average 12 months old, the parent answered questions about the child's temperament (Infant Behavior Questionnaire (IBQ)) and questions that concerned involvement in BookStart. We conducted oral interviews with the parents to avoid less educated parents leaving the study.

### Procedure

Over a period of two months, trained students interviewed parents visiting well-baby clinics located in five different municipalities (The Hague, Hilversum, Naarden-Bussum, Schiedam, and Vlaardingen). Parents with babies between six and nine months old visiting the clinic for their regular periodic not obligatory checkup were briefly interviewed, if they consented, about education level, home language, and whether they had received an invitation to participate in BookStart. At the end of the brief interview, parents were invited to consider participation in a study at home a few months later. They received a folder with information about the study's aims, and were contacted later by phone for permission. In total, 70 parents complied our selection criteria (able to answer questions in Dutch and about the same number of participants from low-, middle-, and high-educated families) and agreed to participate in the study. During the home visit at about 12 months parents answered questions about book reading and BookStart and completed the Infant Behavior Questionnaire (IBQ).

We also observed parents during book sharing but these results are not reported in this chapter. All parents gave written informed consent for participation in the study. Part of this group agreed and succeeded ( $n = 38$ ) in recording the language input from the child's environment including the number of words spoken by adults (Adult Word Count), child vocalization count, and the number of conversational turns for a whole day using the Language Environment Analysis System (LENA).

### Participants

From a total of 174 parent-child dyads, willing to participate, 29 were insufficiently able to answer questions due to a limited proficiency in Dutch. From the remaining 145, twelve parents did not answer invitation emails and repeated phone calls and the other participants ( $n = 63$ ) were not selected for inclusion in the study because they did not fit into the left-over slots. The final group of participants ( $N = 70$ ) did not differ from the excluded group in gender and age but the educational level of the parents was higher in this group ( $\chi^2(1) = 7.43, p < .01$ ). Table 1 presents descriptive data for both parents who reported to participate in BookStart ( $n = 21$ ) and for parents who did not ( $n = 49$ ).

**Table 1** Characteristics of families participating in BookStart and families not participating in BookStart

	Participates in BookStart ( $N=70$ )			
	Yes ( $n = 21$ )		No ( $n = 49$ )	
<i>Demographic variables</i>	%		%	
SES				
High (> vocational level)	85.7		59.2	
Temperament (IBQ)				
$\geq 4$ (high reactivity)	42.9		28.6	
Number of children				
one child	52.4		32.7	
Library membership				
Yes	47.6		20.4	
Participation in workshops				
Yes	4.8		2.0	
Library visits (at least once a month)				
Yes	42.9		4.1	
Living in BookStart area				
Yes	81.0		46.9	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Child's age during home visit (in months)	12.29	1.23	12.27	1.20

## Measures

**Background variables.** During a brief interview at the clinic we asked questions about home language, whether they had received an invitation to participate in BookStart, number of children, and education level of the parent caring most for the child. Parents indicated the highest level of education: primary or special education, vocational level or college and university degree. For the data analyses we made a distinction between low-educated parents (at best vocational level) and high-educated parents (college or university degree).

**Participation in BookStart.** During the home visit parents were asked whether they had collected the BookStart package at the library and, if they did, whether they made use of free access to the library for their baby and followed BookStart workshops at the library.

**Infant Behavior Questionnaire.** Parents completed the Infant Behavior Questionnaire – revised (IBQ-r; Gartstein & Rothbart, 2003; translated from English into Dutch by M. Roest-de Zeeuw & K. van Doesum). On 8-point scales (ranging from always to not applicable) they described the child's behavior in parent-child interaction. The scale covered questions targeting the infant's temperamental reactivity while lying on its back, and bathing-, dressing-, play-, face-, and hair washing activities. We calculated a sum score of these items with, according to a previous study (van den Berg & Bus, 2014), high loadings on temperamental reactivity and classified all children with a mean score higher than four on the 8-point scales as having a more reactive temperament.

**Language Environment Analysis System (LENA).** Parents were asked to attach the Language Environment Analysis digital language processor (LENA dlp) for ten hours to their child's clothes a week after the home visit. We promised parents that the LENA data would be handled anonymously and that we had permission from the ethical board to use LENA dlp and associated software in our study. Registration took place between 10 a.m. and 5 p.m. We used the LENA software (Xu, Yapanel, & Gray, 2009) to estimate the number of words spoken by the adults, child vocalization count, number of conversational turns (back and forth communication within five seconds), other child fragments (word count of other children in the environment of the baby), overlap (several individuals speaking at the same time), television, noise, silence, and fuzz (all noises that LENA could not identify).

In order to check the validity of LENA scores in a Dutch sample, we randomly filtered out one five-minute fragment with baby noises per hour, for all eight hours of recording, and counted the number of baby vocalizations during these fragments. Intercoder reliability for baby vocalizations showed reasonable overlap between



LENA software and the coder ( $r = .69$ ). We did not validate the adult word count, as we did not receive permission from parents to listen to and code the content of adult language.

## Results

In total, 30% of the families participating in the study collected the BookStart case. Only 4.1% of the parents, who had not collected the BookStart case, visited the library at least once a month, whereas 42.9% of the BookStart parents visited the library once a month ( $t(68) = 4.61, p < .001$ ). Participation in workshops was rare; only two parents visited the parent-child workshop offered in the library during the research period.

### **Educational level and reactivity as predictors of participation in BookStart**

A sequential logistic regression analysis was accomplished to determine how families that participated in the BookStart project differed from families that did not participate. In the model, we entered background variables including educational level of the parents, number of children in the family, library membership of the parent, and BookStart library in the municipality as covariates. After including the four covariates as a first step, we included negative emotionality in a second step and determined whether the log-likelihood increased significantly with the inclusion of this independent variable.

There was a good model fit (discrimination among groups) on the basis of the four background variables alone,  $\chi^2(7) = 9.30, p = .23$ , using a deviance criterion. After addition of the independent variable negative emotionality,  $\chi^2(8) = 10.81, p = .21$ , Nagelkerke  $R^2 = .50$ . However, with negative emotionality as the only predictor, there was not a good model fit, indicating that including all background variables was necessary to achieve a good model fit. Comparison of log-likelihood ratios for models with and without the negative emotionality showed reliable improvement with the addition of this variable,  $\chi^2(1) = 4.94, p < .05$ . That means that negative emotionality significantly improved the model that included all necessary background variables.

Overall classification was quite impressive. On the basis of four covariates, classification rates were 61.9% for the BookStart group and 93.9% for the non-BookStart group; the overall correct classification was 84.3%. After addition of negative emotionality the overall classification rate of the model remained the same. However, classification within the BookStart group improved to 89.8%.

Table 2 shows the contribution of the individual predictors to the model by comparing models with and without each predictor. All four covariates and negative

emotionality enhanced prediction. Odds ratios greater than 1 show the increase in odds of an outcome of 1 (the “response” category) with a one-unit increase in the predictor. All predictors had an odds ratio greater than 1. The relative risk of participating when the child has a reactive temperament was slightly greater than 5. This indicates that parents of children with high levels of temperamental reactivity were 5.37 times more likely to participate in the BookStart project than parents of children scoring low on temperamental reactivity ( $OR = 5.37, 95\% CI = [1.13 - 25.50], p < .05$ ).

### **Verbal interaction as predictor of participation in BookStart**

In a subsample of 38 children (26% BookStart) verbal interaction was registered during one day. Factor analysis was carried out to find the best predictor for verbal interaction. Next, a logistic regression analysis was performed to assess whether intensity of verbal interaction predicts participation in BookStart.

**Verbal interaction.** All data collected between 10 a.m. and 5 p.m. were corrected for sleeping time of the child and a principal factors extraction with varimax rotation was performed on eight outcome variables: adult word count (number of words spoken by the adults), child vocalization count, number of conversational turns (back and forth communication within five seconds), other child fragments (word count of other children in the environment of the baby), overlap (several individuals speaking at the same time), television, noise, silence, and fuzz (e.g., all noises that LENA could not identify). One of the three extracted factors was a strong indicator of verbal interaction with the child. Adult word count, child vocalization count, and conversational turns had high loadings on this factor explaining 22.96% of the variance in LENA scores. The other two factors were not indicators of verbal interaction with the child and therefore not further analyzed. Those were indicators for background noises and electronic sounds, explaining 32.61% and 13.76% of the variance in LENA scores, respectively.

**Logistic regression.** The data enabled us to test whether the intensity of the actual parent-child interactions predicted participation in BookStart. A logistic regression that included all covariates produced extremely large parameter estimates and standard errors indicating that there were too few cases relative to the number of predictor variables. The sequential logistic regression analysis was therefore performed on the basis of two background variables entered in the first step and verbal interaction entered in a second step. Background variables were whether or not the family lived in a BookStart area and educational level of the main caregiver.

**Table 2** Logistic regression analysis with four covariates entered in the first step and reactivity level as predictor of participation in BookStart entered in a second step

Variables	B (SE)	Wald test (z-ratio)	Odds Ratio	95% Confidence In- terval for Odds Ratio		$\chi^2$ (1)
				Lower	Upper	
First Step						
BookStart area	2.20 (.79)	7.74**	9.06	1.92	42.77	9.67**
Number of children	2.46 (.93)	7.05**	11.72	1.91	72.05	9.22**
Library membership	2.55 (.96)	7.05**	12.78	1.95	83.75	8.86**
Education level	2.34 (.89)	6.85**	10.38	1.80	59.85	8.99**
Full model: Step one	-5.03 (1.22)	17.07**	.00			
Second Step						
Reactivity level	1.68 (.80)	4.48*	5.37	1.13	25.50	4.94*
Full model: Step two	-6.40 (1.55)	16.98***	.00			

Note. \* $p \leq .05$ , \*\* $p \leq .01$ , \*\*\* $p \leq .001$

There was a good model fit on the basis of the two background predictors alone,  $\chi^2(2) = .15, p = .93$ , using deviance criterion. As depicted in Figure 1, the relation between the intensity of actual verbal interactions and participation in BookStart was quadratic, meaning that two subsamples, the least intensive and most intensive interacting families, were more likely to participate in BookStart than families scoring in the middle on verbal interactions. After addition of the verbal interaction variable and the quadratic function of this variable, in the second step of the logistic regression analysis, the model still fitted the data,  $\chi^2(4) = 4.99, p = .76$ , Nagelkerke  $R^2 = .41$ . Comparison of log-likelihood ratios for models with and without quadratic function of verbal interaction showed reliable improvement with the addition of verbal interaction,  $\chi^2(4) = 6.14, p < .05$ . That means that, in addition to BookStart area and parental education level, verbal interaction is an important predictor of participation in BookStart. There was not a good model fit when leaving out the background variables, indicating that control for background variables is a necessary step. The overall classification was significantly better in the model when verbal interaction was included (84.2%) as compared to the model that only included covariates (73.7%). On the basis of two covariates classification rates were 60.0% for the BookStart group and 78.6% for the non-BookStart group. After addition of verbal interaction the classification changed to 50.0% for the BookStart group and 96.4% for the non-BookStart group.

**Parental Reports versus LENA observations.** Is the reactivity level of the child as measured with IBQ related to verbal interaction as assessed with the LENA device, meaning that scores on IBQ reflect problematic interactions in the family? A quadratic curve best described the association between these reactivity level and actual verbal interaction ( $F(2, 35) = 4.68, p < .05, R^2 = .21$ ). Temperamentally reactive children either revealed low or high scores on verbal interaction. This indicates that parents either ignored the negative behavior of the child resulting in low levels of verbal interaction or scores on verbal interaction were high due to comforting or soothing the child. Results indicate that scores on the questionnaire (IBQ) agree with intensity of verbal interaction as registered with the LENA device.

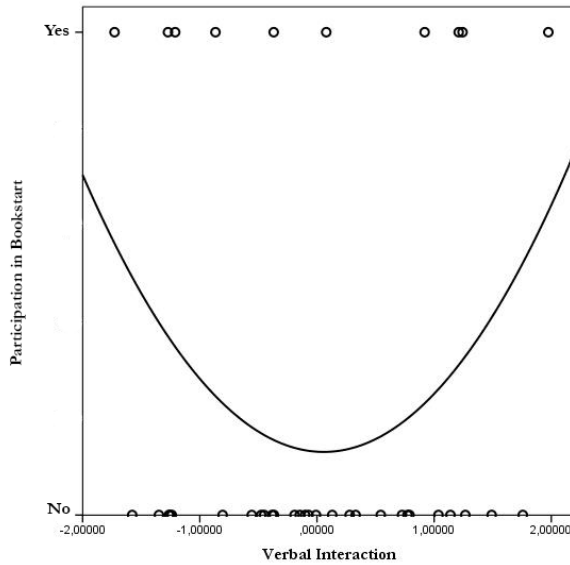


Figure 1. Association between verbal interactions as registered with the LENA device and participation in BookStart

Table 3 Logistic regression analysis with verbal interaction as predictor of participation in BookStart

	Variables	B (SE)	Wald test (z-ratio)	Odds Ratio	95% Confidence Interval for Odds Ratio	
					Lower	Upper
First Step	BookStart area	1.52 (.97)	2.45	4.58†	.682	30.71
	Education Level	2.98 (1.36)	4.78	19.67†	1.36	284.26
Full model: first step	Constant	-3.48 (1.29)	7.32	.03**		
Second Step	Verbal interaction					
	Factor score	.01 (.46)	.00	1.01	.41	2.48
	Quadratic function	1.14 (.55)	4.30	3.11*	1.06	9.12
Full model: second step	Constant	-5.40 (1.75)	9.51	.01*		

<sup>a</sup> Tested against average verbal interaction category

Note. † $p \leq .10$  \* $p \leq .05$ , \*\* $p \leq .01$

## Discussion

Parents are free to participate in BookStart - a nation-wide project - that aims to stimulate shared book reading starting in the first year of life. Apart from obvious background variables that affected the participation rate in BookStart (i.e., library membership of the parent, number of children in the family, education level of the parent caring most for the child), this study offers unique evidence that parents participate more when the interaction with the baby is unsatisfactory. Interestingly, parents are more receptive to participation in BookStart when the child has a negative temperament. Parents who characterize their children as highly reactive, according to scores on the Infant Behavior Questionnaire, were more than five times more likely to collect the BookStart case from the library than parents of less reactive children. We also found that the actual quality of verbal interaction between parent and child predicts participation in BookStart. When verbal interaction is limited in intensity or on the contrary is extremely intense, parents are more inclined to participate in BookStart. We found a correlation between parental reports on the IBQ and LENA scores and impact of both variables on participation in BookStart. Parents are apparently aware of problems in interaction with their baby and they seize the opportunity to participate in BookStart as a way of receiving advice on how to improve an unsatisfactory situation. Very limited verbal interaction or intense verbal interaction with the baby may result from a reactive temperament and be the reason for participation in BookStart. Parents use BookStart in their search for solutions to improve an unsatisfactory situation. These results are promising because they show that it is not only parents who would, in any case, succeed in initiating verbal interaction with the baby that participate but parents also participate because they regard the interaction with the baby as unsatisfactory. This finding also opens up new possibilities for motivating parents to participate in BookStart. All parents want the best for their young child and, if they have the idea that the verbal interaction with their child needs improvement, their interest in projects like BookStart increases.

Only 13% of the less educated parents chose to participate in BookStart while in the highly educated group about 38.3% picked up a BookStart case. As the number of children with a difficult temperament was about the same in both groups - about one third of the children in less- and highly educated families - this suggests that, in particular, highly educated parents show interest in the BookStart materials when interactions with their child are not optimal. Although parents with a low educational background notice the problematic nature of interaction with a highly reactive child, the BookStart project fails to attract less educated parents to the same extent as highly

educated parents. Highly educated parents are aware of the need of verbal input and value help to improve verbal interaction with their baby. Less educated parents, by contrast, may not be aware of the importance of verbal interaction in the family for the language development of their young child. Parents with a low educational background might therefore be less motivated in their search for support, even if they are discontented with the interaction with the baby. The lower participation rate of parents from a low educational level in the BookStart project is alarming as, especially for these parents, BookStart can make a difference in preventing children from a word gap when entering school. Previous research in families with a low educational background shows that parents tend to interact less frequently with their children (e.g., Hart & Risley, 2003). The current results indicate that BookStart does not contribute to narrowing the word gap at school entrance between children from less and highly educated families. The project may support “the rich” instead of “the poor”, which may strengthen the Matthew effect: “the rich get richer and the poor poorer”.

Parents may be more motivated to make an early start with book sharing when they realize how vital verbal interaction is. The parents may possibly need more coaching when it is apparent that their verbal interaction can be improved, and this in turn would improve the baby’s language skills. Participation in BookStart by low-educated parents might be stimulated by showing those parents that the actual language input in their family is not sufficient for the language development of their child. In the United States, programs are in the making that use the LENA device to collect data about language input during the day and these LENA results are being used to make parents aware of shortcomings in verbal input. First results of coaching based on LENA observations are just coming out and seem promising (Dana Suskind at [www.tmw.org](http://www.tmw.org)). Engaging low-income parents more frequently in parent-child interactions during a six-week intervention with the LENA device resulted in a higher word exposure, that is, children heard 32% more words per hour. In addition to these findings, our current study suggests that direct feedback based on LENA assessments can reduce differences between children from highly and less educated families and can be especially useful in making parents with a low educational background more aware of the lack in verbal parent-child interaction.

In sum, an extensive program such as BookStart is effective for parents with a high educational background. When these parents regard interactions with their baby as unsatisfactory, they are motivated to participate in BookStart. However we need to put more effort in giving parents with a low educational background insight into the lack of interaction with reactive children. By making these parents aware of the importance of the quality of verbal interaction within their family, they might be more willing to participate in BookStart and make an early start with book sharing.

**Limitations**

Due to the small sample size and the fact that parents had just started with BookStart, we could not draw clear cause-and-effect conclusions about the association between participation in BookStart and language development of the child. Although we found effects of BookStart in previous studies on language skills of children at 15 and 22 months (van den Berg & Bus, submitted) and moderate effects on the language development of children with a reactive temperament (van den Berg & Bus, 2014), most parents in the current study received the BookStart case only a couple of months before we started testing. During that period BookStart could barely affect differences in language scores.

We assume that low-educated parents are less aware of the importance of verbal input in the family and are therefore less inclined to participate in BookStart, even though they notice that interactions are unsatisfactory. We were, however, unable to test this presumption by examining the effect of an interaction between educational level of the parent and reactivity of the child on participation in BookStart. In the current study only 13% of less educated parents decided to participate in BookStart and, given the overall low number of participants it was impossible to test this relation.



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