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Brief Report

Early sensitivity to arguments: How preschoolers weight circular arguments

Hugo Mercier *, Stéphane Bernard, Fabrice Clément

Centre de Sciences Cognitives, Université de Neuchâtel, 2000 Neuchâtel, Switzerland

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ABSTRACT

Observational studies suggest that children as young as 2 years can evaluate some of the arguments people offer them. However, experimental studies of sensitivity to different arguments have not yet targeted children younger than 5 years. The current study aimed at bridging this gap by testing the ability of preschoolers (3-, 4-, and 5-year-olds) to weight arguments. To do so, it focused on a common type of fallacy—circularity—to which 5-year-olds are sensitive. The current experiment asked children—and, as a group control, adults—to choose between the contradictory opinions of two speakers. In the first task, participants of all age groups favored an opinion supported by a strong argument over an opinion supported by a circular argument. In the second task, 4- and 5-year-olds, but not 3-year-olds or adults, favored the opinion supported by a circular argument over an unsupported opinion. We suggest that the results of these tasks in 3- to 5-year-olds are best interpreted as resulting from the combination of two mechanisms: (a) basic skills of argument evaluations that process the content of arguments, allowing children as young as 3 years to favor non-circular arguments over circular arguments, and (b) a heuristic that leads older children (4- and 5-year-olds) to give some weight to circular arguments, possibly by interpreting these arguments as a cue to speaker dominance.

Introduction

To avoid being deceived and cheated at every turn, humans must be able to evaluate communicated information. It has been suggested that to solve this problem they possess cognitive

* Corresponding author.
E-mail address: hugo.mercier@gmail.com (H. Mercier).

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mechanisms of *epistemic vigilance* that rely on a variety of cues to gauge the reliability of speakers and the plausibility of information received through communication (Sperber et al., 2010). The development of these mechanisms has been the topic of intense work that has shown, for instance, that 4-year-olds and, under certain conditions, 3-year-olds select sources of information based on their benevolence (Mascaro & Sperber, 2009), their reliability (Corriveau & Harris, 2009b), their emotions (Clément, Bernard, Grandjean, & Sander, 2013) and their familiarity (Corriveau & Harris, 2009a) (for reviews, see Clément, 2010; Harris, 2012). This work has focused on testimony, and the outcome studied was whether children accept a character's testimony or not or which character's testimony they accept.

However, in children's everyday lives, testimony is often only a part of a larger interaction. For instance, if a child rejects an adult's testimony, the adult is likely to provide reasons to support his or her testimony. Observational studies have shown that parents use reasons to convince their children (although there is substantial variability in how much they do so) and that these reasons can be effective (see Grusec & Goodnow, 1994). Moreover, reason giving by parents can push even very young children (18- to 24-month-olds) to provide reasons of their own (Kuczynski & Kochanska, 1990; Kuczynski, Kochanska, Radke-Yarrow, & Girnius-Brown, 1987; Perlman & Ross, 2005). Children also exchange arguments with each other, a skill critical to conflict resolution (Ram & Ross, 2001, 2008; Ross, Ross, Stein, & Trabasso, 2006).

Besides demonstrating the importance of argumentation in children's interactions, these observational studies suggest that young children can evaluate arguments—that is, accept sound arguments and reject weak arguments. Experimental studies have also tested these skills (for a review, see Mercier, 2011). In the moral domain, 8-year-olds are more sensitive to empathic arguments than to normative arguments (Eisenberg-Berg & Geisheker, 1979; see also Kuczynski, 1982). In conservation tasks, 7-year-olds are more likely to be swayed by arguments supporting the correct answer than by those supporting one of the wrong answers (Miller & Brownell, 1975). As detailed below, Baum, Danovitch, and Keil (2008) showed that 6-year-olds prefer non-circular explanations over circular explanations (as this article was going to press, a study was accepted that extends Baum et al's results to 3- to 5-year-olds (Corriveau & Kurkul, in press)—its results, which we cannot do more than briefly mention now, are in overall accord with the present conclusions).

Although the observational and experimental studies converge in demonstrating children's argumentative skills, there is a gap of several years between the earliest observations of argumentative interactions (in 18-month-olds) and the earliest experimental demonstrations of argument evaluation (in 6-year-olds). To bridge this gap, we tested the ability of young children (3- to 5-year-olds) to weigh simple arguments.

Circular arguments provide a good tool to study young children's ability to weigh arguments. Despite being, with a few exceptions (Walton, 1985), fallacious, circular arguments are found in the production of both adults and children, so that children are likely to have already been exposed to such arguments (see Baum et al., 2008). Previous work has shown that adults can generally spot and reject circular arguments (Hahn & Oaksford, 2007; Rips, 2002) and that 6-year-old children favor non-circular explanations over circular explanations (Baum et al., 2008). In this latter study, the experimenters devised two circular explanations and one non-circular explanation for various facts such as the whiteness of polar bears' fur. One circular explanation was short, making it blatantly circular ("They have white fur because their fur is always white"). The younger children (kindergartners with a mean age of 5 years 8 months) were less likely than chance to pick this short circular explanation as most felicitous among the three explanations. However, when children were provided only with a choice of a long, less obviously circular explanation and a non-circular explanation, only second graders (with a mean age of 8 years 3 months) reliably selected the non-circular explanation.

These results suggest that young children might be sensitive to circular arguments in some circumstances. Given that the current study was concerned with even younger children, blatant circular arguments were used (by contrast, in Baum et al.'s (2008) study, not all of the explanations were as blatantly circular; e.g., "[Dishwashers] work because they make things that you put in them clean"). The mode of reason giving was also shifted from explanation to argument. In an explanation the conclusion is agreed on (e.g., polar bears have white fur), whereas in an argument the conclusion is disputed. In the current experiment, children needed to help someone find a pet by deciding which of

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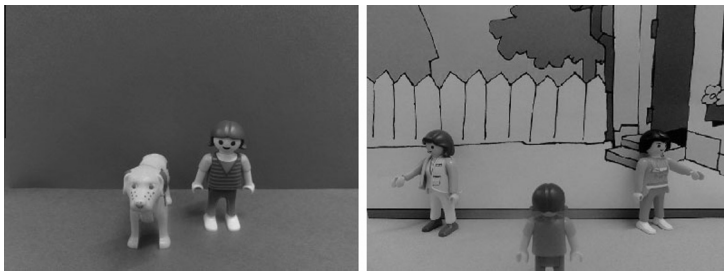

Fig. 1. Left: Presentation of Marta and her dog (Vignette 1). Right: The two characters indicating different directions (Vignette 2).

two contradictory opinions to follow. Being uncertain about the conclusion might strengthen children's motivation to pay attention to the reasons given by the speakers.

Our first task pitted a circular argument against a strong argument. Three-year-olds understand that looking in a box makes an informant able to reliably tell what it contains (Robinson, Champion, & Mitchell, 1999). Accordingly, the strong argument used in Task 1 was an argument from perception of the form "X is the case because I have seen X."

The strength of the argument from perception could make it difficult to detect any weight the children give the circular argument. Therefore, the second task pitted a circular argument against nothing; one speaker simply does not provide any argument supporting her position. Reasons can be given some weight irrespective of their intrinsic value. For instance, adults are more likely to comply with a minor request when it is accompanied by a circular explanation ("May I use the Xerox machine because I have to make copies?") than by no explanation at all (Langer, Blank, & Chanowitz, 1978). Similarly, children might give some weight to circular arguments over the absence of argument.

Method

Participants

This experiment involved 84 children: 27 3-year-olds (9 girls and 18 boys, M_{age} = 43 months, SD = 4.18, range = 32–47), 29 4-year-olds (16 girls and 13 boys, M_{age} = 54.37 months, SD = 3.14, range = 49–59), and 28 5-year-olds (15 girls and 13 boys, M_{age} = 68.25 months, SD = 5.04, range = 62–79) from four day-care centers in Neuchâtel, Switzerland.[1] Most children came from middle-class and upper middle-class families. Each child was seen individually in a quiet room by a single experimenter for approximately 10 min. In addition, 39 adults from the University of Neuchâtel were tested as a control group (31 women and 8 men, M_{age} = 21.3 years, SD = 2.14, range = 18–31).

Materials and procedure

Task 1: Circular argument versus perceptual argument

In the first vignette, a young Playmobil girl, "Marta," and her dog were presented to the children on a computer screen. The experimenter explained that Marta's dog often escapes and Marta needs to look for her dog. Then the experimenter said, "In this game, you will try to help Marta find her dog" (Fig. 1, Vignette 1).

A second vignette showed Marta facing two Playmobil female characters. Each one pointed toward a different direction. The experimenter said, "For instance, one day, Marta is looking for her dog in front of a house. These two ladies tell her something. Actually, these two ladies do not agree with each other. We are going to listen to them" (Fig. 1, Vignette 2).

[1] All of the participants were Swiss, and all of the experiments were conducted in French.

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At this point, an animation bubble and a recording voice were activated for one of the women. For instance, for the perceptual argument, children heard, "The dog went this way because I've seen him go in this direction" ("Le chien est parti par là parce que je l'ai vu partir de ce côté"). For the circular argument, the child heard the other woman say, "The dog went this way because he went in this direction" ("Le chien est parti par là parce qu'il est parti de ce côté"). Children wore headphones to listen to the messages. The character's locations, the order of bubble activation, the argument, and the voice attribution for the character were counterbalanced.

Finally, the experimenter asked children, "According to you, where did Marta's dog go?".

The two other test pictures were built like Vignette 2. The background of each picture, the female characters, and their voices were varied. Children could obtain a maximum score of 3 points—1 point for each story in which the character with the circular argument was chosen.

Task 2: Circular argument versus absence of argument

The design of the task was similar to that of Task 1. Children needed to help "Lara" find her cat. Two characters disagreed about where the cat went. One of them used the same circular argument as in Task 1. The other did not provide any arguments, simply stating, "The cat went this way" ("Le chat est parti par là"). Children could obtain a maximum score of 3 points—1 point for each story in which the character with the circular argument was chosen.

For each of the six stories making up Tasks 1 and 2, two Swiss volunteers were asked to say the two sentences in a neutral tone. All recordings were normalized in amplitude to 30 decibels and standardized to 4 s in duration.[2] Children were presented with the two tasks in a counterbalanced order. After the last task, a picture showed Marta and Lara with their respective pets and the experimenter told children that, thanks to them, each character had found her pet.

A similar task that did not require visual displays was created for the adult participants. Two characters made contradictory statements regarding the position (left or right) of an object, and they supported their statements with the same types of arguments as those provided to the child participants (e.g., "In the painting, the red triangle is to the left because I have seen it is on this side," "In the painting, the red triangle is to the right because it is on this side," "In the painting, the red triangle is to the right").

Results

Circular argument versus perceptual argument

The percentage of choices linked to circular arguments was 37% for the 3-year-olds, 27.6% for the 4-year-olds, 30.9% for the 5-year-olds, and 29.1% for the adults (Fig. 2).[3] A one-way analysis of variance (ANOVA) with age group (3-year-olds, 4-year-olds, 5-year-olds, or adults) as the between-participants variable was calculated for the proportion of times (with an arcsin transformation) children chose the circular argument. This revealed no significant main effect of age group, $F(3, 119) = 0.057$, $p = .98$, $\eta^2 = .001$. Choices linked to the circular argument were significantly below chance both for the participants as a whole, $t(122) = -5.84$, $p < .001$, and within each age group: 3-year-olds, $t(26) = -2.52$, $p = .018$; 4-year-olds, $t(28) = -3.28$, $p = .003$; 5-year-olds, $t(27) = -2.55$, $p = .017$; adults, $t(38) = -3.28$, $p = .002$.

To better understand these results, the participants' response profiles were investigated. Participants were categorized as belonging to one of the following three categories: (a) circular argument profile (all three answers circular), (b) perceptual argument profile (all three answers perceptual), or (c) mixed profile (other profiles).[4] Table 1 suggests that although standard tests did not indicate significant differences among the age groups, the performance of the 4- and 5-year-olds and adults differs

[2] In the absence of argument condition, the length of the recording was matched, resulting in a short silence at the end of the recording.

[3] Preliminary analyses revealed no significant effects involving gender and order (Task1/Task2, Task2/Task1). Thus, these two factors were not introduced into the following analyses.

[4] One 3-year-old needed to be removed from this analysis because he gave only two answers.

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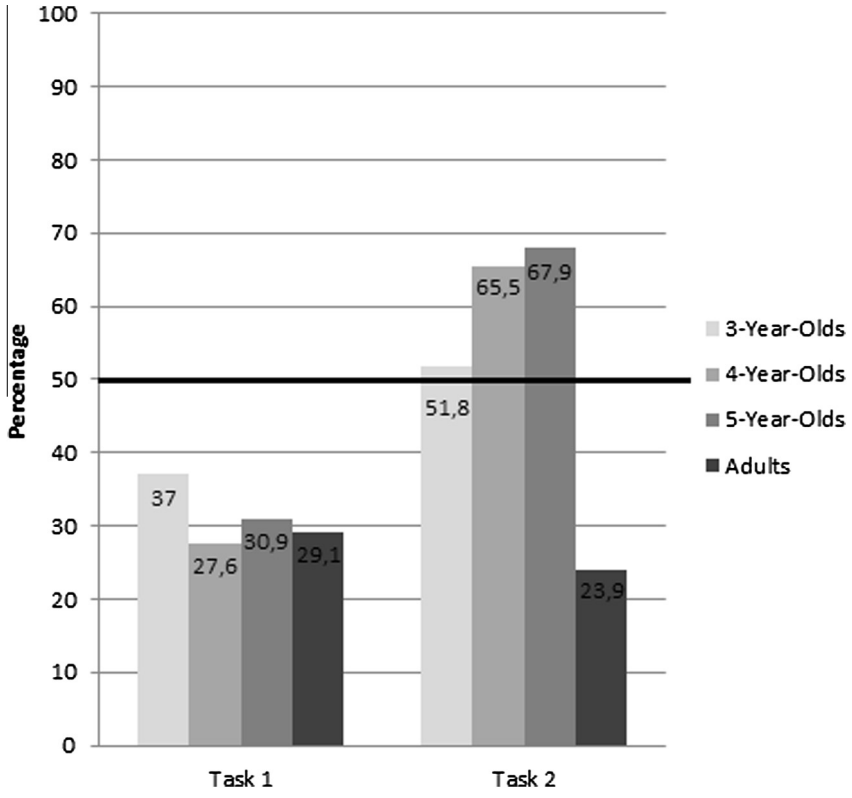

Fig. 2. Percentages of choices linked to the circular arguments in Tasks 1 and 2 for each age group (chance line is at .50).

Table 1
Percentage of each profile in Tasks 1 and 2 for each age group.

		3-year-olds	4-year-olds	5-year-olds	Adults
Task 1	CP	0.0 (n = 0)	13.8 (n = 4)	17.8 (n = 5)	17.9 (n = 7)
	PP	26.9 (n = 7)	55.2 (n = 16)	53.6 (n = 15)	59.0 (n = 23)
	MP	73.1 (n = 19)	31.0 (n = 9)	28.6 (n = 8)	23.1 (n = 9)
Task 2	CP	12.0 (n = 3)	41.4 (n = 12)	46.4 (n = 13)	12.8 (n = 5)
	AP	20.0 (n = 5)	13.8 (n = 4)	10.7 (n = 3)	64.1 (n = 25)
	MP	68.0 (n = 17)	44.8 (n = 13)	42.9 (n = 12)	23.1 (n = 9)

Note. CP, circular argument profile; PP, perceptual argument profile; AP, absence of argument profile; MP, mixed profile.

from that of the 3-year-olds. The number of children having a perceptual argument profile doubles between the 3- and 4-year-olds and stays at that level for the 5-year-olds (and adults), and there is an increase in the circular argument profiles at the same time. Together, these developments suggest that different mechanisms explain the similar overall performance of the different age groups. Whereas the 3-year-olds simply exhibited a tendency to favor the argument from perception, the 4- and 5-year-olds and adults were divided between, on the one hand, a strong tendency to systematically favor the argument from perception and, on the other, a weaker tendency to systematically favor the circular argument. The results of Task 2 support this analysis for the children.

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Circular argument versus absence of argument

The percentage of choices linked to circular arguments was 51.8% for the 3-year-olds, 65.5% for the 4-year-olds, 67.9% for the 5-year-olds, and 23.9% for the adults (Fig. 2). A one-way ANOVA with age group (3-year-olds, 4-year-olds, 5-year-olds, or adults) as the between-participants variable was calculated for the proportion of times (with an arcsin transformation) children chose the circular argument. This revealed a significant main effect of age group, $F(3, 119) = 8.98$, $p < .001$, $\eta^2 = .185$. Post hoc Bonferroni tests showed that the adults' performance was significantly lower than that of the 4-year-olds ($p < .001$) and 5-year-olds ($p < .001$). No significant difference was found between the performance of the 3-year-olds and adults ($p = .138$), between the 3- and 4-year-olds ($p = .544$), between the 4- and 5-year-olds ($p = 1.00$), or between the 3- and 5-year-olds ($p = .282$). The performance was at chance for the 3-year-olds, $t(26) = 0.285$, $p = .78$, significantly above chance for the 4-year-olds, $t(28) = 2.31$, $p = .028$, and the 5-year-olds, $t(27) = 2.65$, $p = .013$, and significantly below chance for the adults, $t(38) = -4.44$, $p < .001$.

The same response profile analysis was conducted with Task 2. Participants were categorized as belonging to one of the following three categories: (a) circular argument profile (all three answers circular), (b) absence of arguments profile (all three answers absence of argument), and (c) mixed profile (other profiles).[5] Table 1 indicates a marked increase in the percentage of children with a circular argument profile from 3-year-olds to 4- and 5-year-olds. This result is consistent with the interpretation of the profiles in Task 1 and supports the idea that, between 3 and 4 years of age, some children develop a systematic tendency to favor the circular argument. This interpretation is strengthened by the fact that 7 of 9 children who had circular argument profiles in Task 1 also had circular argument profiles in Task 2. Crucially, the circular argument profiles in Task 1 cannot be explained as a carried over preference from Task 2, in which a circular argument profile is much less surprising, because 7 of the 9 children with a circular argument profile in Task 1 started the experiment with Task 1. Potential difficulties with this interpretation are discussed in the Discussion section. Adults showed the opposite pattern, with a strong negative reaction to the circular arguments.

Discussion

The goal of this experiment was to bridge the gap between observational and experimental studies of young children's argumentative skills. To do so, we studied the way preschoolers (and, as a control group, adults) treat a conspicuously poor argument in two tasks. In each task, children needed to help find a lost pet by deciding which of two speakers to follow. One speaker indicated a direction and supported her statement with a conspicuously poor argument—a circular argument. The other speaker indicated a different direction and supported her statement with an argument from perception (Task 1) or left her position unsupported (Task 2).

In Task 1, participants as a whole, as well as each age group, were more likely to follow the speaker who had used the argument from perception than to follow the speaker who had used the circular argument. These results point to the existence of basic skills of argument evaluation that children would possess at least from 3 years of age onward. Although caution is necessary given that a single circular argument was tested, this conclusion is in line with the hypothesis that basic skills of argument evaluation are one of the fundamental tools of epistemic vigilance (Mercier, 2011; Mercier & Sperber, 2011). The decrease in mixed profiles (participants who did not endorse the same argument each of three times) with age suggests a developmental refinement of these basic skills of argument evaluation, with older children more consistently endorsing the testimony supported by the strong argument (increase in perception argument profile).

Although most consistent participants favored the argument from perception (42.5% of all children, 59% of the adults), some of the 4- and 5-year-olds and adults consistently favored the circular argument (13.8%, 17.8%, and 17.9% of circular argument profiles, respectively). The good overall performance of the 4- and 5-year-olds and adults suggests that few of them answered at random.

[5] Two 3-year-olds needed to be removed from this analysis because they gave only two answers.

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Instead, these consistent choices for the opinion supported by the circular argument could reflect a heuristic that makes children and adults give some weight to this type of argument.

Task 2 provides a test of the existence of such a heuristic for children. The children favored the opinion supported by the circular argument in contrast to an unsupported opinion, although this effect was observed only among the 4- and 5-year-olds, with the 3-year-olds equally likely to follow either opinion. Moreover, a plurality of 4- and 5-year-olds consistently followed the opinion supported by the circular argument (41.4% and 46.4% of circular argument profiles, respectively). These results strongly suggest that 4- and 5-year-olds rely on a heuristic that gives some weight to circular arguments. This heuristic would also be weakly present in adults, with 17.9% (Task 1) and 12.8% (Task 2) of them displaying a circular argument profile.

The interpretation of Task 2 in terms of a preference for circular arguments for the 4- and 5-year-olds, however, could be called into question because this task pits a long statement containing the connective *because* (the circular argument) against a short statement with no connective (the absence of argument). This is especially problematic in light of prior research showing that 4- and 5-year-olds favor arguments that contain the connective *because* over the same argument with no connective (Bernard, Mercier, & Clément, 2012). Nevertheless, several considerations support the interpretation of Task 2 suggested here.

The study of Bernard and colleagues (2012) showed that, in contrast to the presence of *because,* small differences in sentence length did not affect children's evaluation of arguments. This study also showed that adults were as likely as children to favor arguments with *because* over arguments with no connective. By contrast, in the current study, adults strongly favored the absence of argument over the circular argument; neither statement length nor the presence of a connective swayed them. If superficial factors such as these, rather than the character of circular arguments, had caused the current performance of the 4- and 5-year-olds, these factors should also affect the adults' performance, as they did in the study of Bernard and colleagues. Finally, the fact that some children evinced a consistent preference for the circular arguments, even when contrasted with the argument from perception that had a connective, was longer, and was stronger, suggests that low-level factors are unlikely to be the main driver of the weight given by children to circular arguments.

If there is a heuristic leading children, and some adults, to give some weight to circular arguments, it does not fit with basic skills of argumentation because the circular arguments used in the study provide no new content that would support their conclusions. Why do many children (and some adults) put some weight on circular arguments instead?

We suggest that circular arguments could be interpreted as a mark of dominance. Dominant individuals should be more likely to rely on a simple restatement of their position as a way of reminding their audience of their authority. In this sense, the circular arguments would be similar to other nonsequiturs, such as "because I say so" and "that's the way it is," often offered to children by adults or other individuals dominant over them (Grusec & Goodnow, 1994; Waksler, 1986). A recent experiment suggests that 3- to 5-year-olds tend to endorse the testimony of a dominant over that of a subordinate (Bernard et al., 2014). Circular arguments could, therefore, affect testimony through an indirect route—by indicating the dominance of the speaker, dominance that would then influence the evaluation of testimony.

The emergence at 4 years of mechanisms of argument evaluation that bear on arguments, but not directly on their content, is compatible with the result mentioned above showing that 4- and 5-year-olds, but not 3-year-olds, favor an argument that contains *because* over the same argument without *because* (Bernard et al., 2012). The fact that 3-year-olds do not react to these cues—connective in Bernard et al.'s (2012) study, circular arguments in the current experiment—could be explained by their indirect nature that would render them more complex to process than the content of simple arguments.

Although some adults also displayed a preference for the opinion supported by the circular argument over the unsupported opinion, most consistently preferred the latter. This could be due to higher standards of argument quality. Falling short of these standards, the circular arguments would be seen negatively (see Hahn and Oaksford, 2007; Rips, 2002), suggesting that this speaker had no better arguments to offer, whereas the other speaker could have a better argument that she has not expressed yet.

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The current results bolster existing observational studies by providing an experimental demonstration of basic skills of argument evaluation in 3- to 5-year-olds. They also point to the possible existence of other heuristics that children could rely on when evaluating arguments such as inferring dominance from the use of circular arguments, inference that would lead them to endorse the opinion supported by the circular argument. These heuristics would be available only to children age 4 years or older. More studies will be necessary to validate this interpretation and elucidate the status of heuristics that bear on aspects of arguments different from their content, their developmental trajectory, and the way these heuristics interact with basic skills of argument evaluation.

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