

Perceptions and practices of self-defined current vegetarian, former vegetarian, and nonvegetarian women

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ABSTRACT

Objective To assess the diversity of vegetarians' dietary practices and how they change over time, and to explore perceptions of meat and dairy products among vegetarians, former vegetarians, and nonvegetarians.

Design Cross-sectional survey; qualitative interviews with a subsample.

Subjects/setting Ninety self-defined current vegetarian, 35 former vegetarian and 68 nonvegetarian women in Vancouver, British Columbia. A subsample of 15 subjects completed qualitative interviews.

Statistical analysis performed Group comparisons using 1-way analysis of variance with post-hoc testing for continuous variables, χ^2 for categorical variables.

Results Of 90 current vegetarians, 51 and 14 reported occasional use of fish or chicken respectively. Fifty-six vegetarians, including 4 of 6 vegans, reported that their diets had become more restrictive over time, and 48 planned additional changes, most frequently a reduction in dairy

product use. Reasons cited by former vegetarians for resuming omnivorous diets included: not feeling healthy, concern about their nutritional status, a change in living situation, or missing the taste of meat. Perceptions of meat and dairy products differed significantly by dietary pattern: nonvegetarians and former vegetarians were more likely than current vegetarians to agree with statements inferring positive attributes (eg, nutrient content). In contrast, more current and former vegetarians than nonvegetarians agreed with statements inferring negative attributes (eg, presence of contaminants).

Applications/conclusions Dietitians who counsel women need to be aware of the heterogeneity of dietary practices and beliefs regarding use of animal products to provide advice appropriate to each individual. At a broader level, addressing women's food safety and animal welfare concerns will likely require collaboration among food industry and government, health, and consumer agencies. *J Am Diet Assoc.* 2002;102:354-360.

Recent surveys suggest that 2% to 4% of North Americans follow vegetarian eating patterns (1,2) and that vegetarianism is more common among women than men (1,3,4). Vegetarians are often defined as those who consume no meat; however, dietary practices of self-defined vegetarians form a continuum. Those who rarely eat red meat but who may consume chicken or fish are at one end and those who exclude all foods containing any animal-derived ingredients (including honey or gelatin) are at the other (1,3-7). Little is known about the extent to which vegetarians' dietary practices within this continuum change over time. Similarly, little information exists about whether (and if so, why) some individuals may choose to resume an omnivorous diet after having been vegetarian.

Considerable research documents motivations for adopting vegetarian diets, including animal rights and ethical reasons, the desire to improve health, environmental concerns, religious beliefs, and concerns about the safety of the food supply, among others (5,6,8-11). However, little is known about veg-

etarians' beliefs regarding the nutritional attributes of meat and dairy products, and whether these beliefs differ from those of nonvegetarians. The latter group's beliefs may also be relevant, given current recommendations emphasizing plant-based diets and lower intakes of animal foods (12-15), in conjunction with women's low intakes of certain nutrients, such as iron and zinc, found in high concentrations in animal products (16-19).

To provide effective counseling, dietitians who counsel women, whether vegetarian or omnivorous, must be aware of varied food-related practices, beliefs, and value systems. The

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Table 1
Demographic characteristics

Characteristic	All subjects (n=193)	Dietary pattern ^a					
		Vegetarian (n=90)		Former vegetarian (n=35)		Nonvegetarian (n=68)	
Age (y) ^b	31.9±8.8	31.6±9.1		31.9±7.4		32.4±9.2	
White***	79.4%	n	%	n	%	n	%
University graduate	49.7%	81	90	27	77	45	66
Student	40.1%	42	47	18	51	36	53
Employed outside home	73.2%	35	39	13	37	29	43
Children in home*	22.8%	70	80	24	69	45	66
		13	14	9	26	22	32

^aDietary patterns were self-defined.

^bMean ± standard deviation.

* $P \leq .05$ by χ^2 .

*** $P \leq .001$ by χ^2 .

Table 2
Percentage and frequency of women consuming dietary protein sources at least weekly

Protein source	Dietary pattern ^a					
	Vegetarian (n=90)		Former vegetarian (n=35)		Nonvegetarian (n=68)	
	n	%	n	%	n	%
Flesh foods						
Fish ^b	11	12	22	65	33	48
Chicken ^b	4	5	23	68	49	72
Beef ^b	0	0	14	40	32	47
Pork ^b	0	0	8	24	18	26
Dairy products and eggs						
Hard cheese	53	60	22	63	37	54
Yogurt	40	46	12	34	37	54
Eggs ^b	32	36	20	57	38	56
Milk ^b	30	34	22	63	38	57
Cottage cheese	12	13	6	18	6	9
Plant protein sources						
Beans ^b	66	74	15	44	17	25
Tofu ^b	54	61	13	38	13	19
Nuts ^b	50	56	15	43	18	26
Soy drink ^b	46	52	4	11	9	13
Lentils ^b	43	48	9	26	11	16
Peanut butter ^b	34	38	7	21	19	28

^aDietary patterns were self-defined.

^bDistributions differed by dietary pattern as assessed by χ^2 .

nature and relative importance of these beliefs may influence the type of diet followed (eg, the degree to which animal products are excluded), and the type of nutritional advice deemed acceptable. Accordingly, this study was conducted to: a) assess the range of dietary practices among women who consider themselves vegetarian; b) explore how vegetarian dietary practices change over time, including an assessment of former vegetarians' motivation and rationale for resuming an omnivorous diet, and c) compare perceptions of meat and dairy products among vegetarians, former vegetarians, and nonvegetarians.

SUBJECTS AND METHODS

Study Design

The study design included a quantitative component completed by 193 women, as well as qualitative interviews completed by a subsample of 15. The study protocol was approved by the University Screening Committee for Research and Other Studies Involving Human Subjects, and participants provided written informed consent.

Participants

For the quantitative aspect of the study, convenience samples of premenopausal vegetarian, former vegetarian, and nonvegetarian women, age range 18 to 50 years, were recruited through notices in university and community newspapers, as well as by word-of-mouth. Separate notices targeted self-defined vegetarian and nonvegetarian women.

At the conclusion of their participation in the quantitative component of the study, women were informed of the qualitative component and invited to participate. From those who were willing to do so, purposeful sampling procedures were used to recruit 15 informants with a range of eating patterns, years of experience with vegetarianism, and age. This sample size is typical of in-depth qualitative interview studies (20).

Survey Instrument

Participants completed a written instrument that provided information about demographics (age, ethnicity, educational attainment, and student status), perceptions of meat and dairy products, dietary protein sources (using a modified food frequency questionnaire), and vegetarian status. Perceptions and attitudes about meat and dairy products were assessed using items developed for this study, although some items assessing attitudes to meat were obtained from a scale developed previously (21). Subjects indicated their agreement with each statement using 5-point Likert-type responses (1 = strongly disagree and 5 = strongly agree).

Current vegetarians indicated whether their vegetarian diet had changed over time and whether they anticipated changing their diet in the coming year. Former vegetarians responded to an open question about what led to their decision to resume an omnivorous diet. The entire instrument was pretested by vegetarian and nonvegetarian women, and minor modifications in wording were made as required.

Semistructured Interviews

Each of the 15 informants completed a semistructured interview based on an interview guide that identified topics to be covered. These included definitions of vegetarian eating, personal practices and attitudes relating to consumption or nonconsumption of various animal products, rationales for

these practices, and beliefs about the health consequences of vegetarianism. The interviews were conducted in an informal, conversational manner, so the order of questions and their specific wording varied. Interviews, averaging 60 minutes in length (range, 35-100 minutes), were audio tape-recorded and verbatim transcripts prepared.

Data analysis

Statistical analysis of the quantitative data was conducted using the Statistical Package for the Social Sciences (SPSS Inc, Version 10.0, 1999, Chicago Ill). Data were entered and verified against original instruments. For continuous variables, differences among vegetarians, past vegetarians, and nonvegetarians were examined using 1-way analysis of variance with post-hoc comparisons using Scheffe's test. χ^2 was used to test for differences in categorical variables. Analyses were conducted at a significance level of $P < .05$, and comparisons were 2-tailed.

Qualitative data analysis, which included a multistep coding procedure, preparation of networks and matrices, and writing summary memos, was facilitated with the use of Atlas.ti computer software (Scientific Software Development, Version 4.1, 1997, Berlin). Stage 1 coding labeled transcript segments with core codes reflecting the main topics of interest, such as reasons for being vegetarian, reasons for not being vegetarian, food acceptance reasons, etc. In Stage 2 coding, one core code was examined at a time, and segments labeled with that code were tagged with more specific labels reflecting what was being discussed. Using the network display in Atlas.ti, codes were then categorized into related topics (eg, animal, health, or sociocultural issues). A matrix was prepared detailing what each participant said about each topic. Summary memos were written to describe the nature and range of issues discussed in each topic. All qualitative analysis was done by one of the authors, who also conducted the interviews.

RESULTS

Subjects

Table 1 presents the demographic characteristics of the 90 self-defined vegetarians, 35 former vegetarians, and 68 nonvegetarians who completed the quantitative portion of the study. No group differences were observed in mean age, which averaged 32 years, nor in educational attainment (about 50% had completed a university degree and about 40% were current students). However, vegetarian women were significantly more likely to be white, and were less likely to have children living with them in the home. Vegetarians had followed a vegetarian diet for a mean (\pm standard deviation) of almost 10 years (9.7 ± 7.6 , range=0.5-42 years). Former vegetarians had followed a vegetarian diet for 3.3 ± 3.6 years (range=0.1-13.0 years) and had resumed an omnivorous diet a mean of 7 years previously (range=0.1-22.5 years).

Diets followed by current vegetarians were extremely diverse. When strict criteria were used to define groups (eg, never eating eggs for a lacto-vegetarian), 6 women were vegan, 11 lacto-vegetarian, 22 lacto-ovo-vegetarian, 37 pescovegetarian, and 14 pollo-pesco vegetarians. However, as shown in Table 2, most women who included fish or chicken did so only occasionally. Compared to nonvegetarians and former vegetarians, who were similar, fewer vegetarians consumed any flesh foods at least weekly. Current vegetarians were also less likely to consume eggs and fluid milk at least weekly, but the

Table 3
Perceptions about red meat: mean scores and percentages of subjects agreeing or strongly agreeing with statements

Statement about meat	Dietary pattern ^a								
	Vegetarian (n=90)			Former vegetarian (n=35)			Nonvegetarian (n=68)		
	Agree or strongly agree		mean ^b ±SD ^c	Agree or strongly agree		mean±SD	Agree or strongly agree		mean±SD
	n	%		n	%		n	%	
(a) I like the flavour of red meat***	9	10	1.6±1.1 ^x	14	40	3.0±1.3 ^y	40	59	3.5±1.0 ^y
(b) Fish and poultry are the best "meat" choices***	38	42	3.0±1.3 ^x	24	69	3.9±1.1 ^y	56	84	4.1±0.8 ^y
(c) Red meat can be part of a healthy diet***	37	41	2.8±1.2 ^x	23	66	3.7±0.9 ^y	58	85	4.0±0.9 ^y
(d) Diets with red meat are healthier than those without***	5	6	1.5±0.9 ^x	4	12	2.3±0.9 ^y	17	25	2.7±1.0 ^y
(e) Eating red meat makes me feel heavy and sluggish***	47	54	3.8±0.9 ^x	17	49	3.3±1.2 ^y	20	29	2.9±1.1 ^y
(f) Red meat contains important nutrients***	17	19	2.4±1.1 ^x	20	57	3.5±1.1 ^y	39	57	3.5±1.0 ^y
(g) Trimmed red meat is as healthful as fish or poultry***	6	7	2.2±0.9 ^x	12	35	2.9±1.0 ^y	27	40	3.1±1.0 ^y
(h) There are toxins in animal fat***	55	61	3.8±1.0 ^x	21	60	3.6±0.7 ^x	17	25	3.0±1.0 ^y
(i) Red meats have unnatural hormones***	74	82	4.3±0.8 ^x	25	71	4.0±0.9 ^x	33	49	3.3±1.0 ^y
(j) I think red meat has antibiotics***	66	73	4.1±1.0 ^x	23	68	3.7±1.2 ^x	24	35	3.2±1.1 ^y
(k) Red meat is difficult to digest***	62	69	3.8±1.1 ^x	20	57	3.3±1.0 ^x	15	22	2.7±1.1 ^y
(l) I am concerned about the amount of fat in red meat	37	42	3.4±0.9	16	46	3.3±1.1	42	62	3.5±1.2

^aDietary patterns were self-defined.

^bMean on a scale of 1 to 5, where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree.

^cSD=standard deviation.

***Groups differed significantly by analysis of variance, $P<.001$.

^{x,y}Means within a row with different superscripts differed significantly by Scheffe's test ($P<.05$).

Table 4
Perceptions about dairy products: mean scores and percentages of subjects agreeing or strongly agreeing with statements

Statement about dairy products	Dietary pattern ^a								
	Vegetarian (n=90)			Former vegetarian (n=35)			Nonvegetarian (n=68)		
	Agree or strongly agree		mean ^b ±SD ^c	Agree or strongly agree		mean±SD	Agree or strongly agree		mean±SD
n	%		n	%		n	%		
(a) Cause gas and bloating in most people	25 ³	28	3.0±1.0	11	31	3.0±1.1	14	21	2.7±1.0
(b) Dairy products taste good	73	81	4.0±0.9	32	91	3.4±0.8	55	81	4.2±0.8
(c) Easy to get enough calcium without dairy	45	50	3.2±1.2	15	43	2.9±1.2	23	34	2.9±1.2
(d) Too fattening to use often*	28	31	2.9±1.2	7	20	2.4±1.1	13	19	2.3±1.2
(e) Diets with dairy too high in saturated fat and cholesterol*	21	23	2.7±1.0	5	14	2.4±1.1	9	13	2.3±1.0
(f) Good sources of protein and nutrients***	54	60	3.3±1.3*	25	71	3.9±1.0 ^y	54	79	4.0±1.1 ^y
(g) Dairy products are not needed by adults***	45	50	3.4±1.3*	13	37	2.7±1.3 ^y	13	19	2.3±1.3 ^y
(h) Diet with dairy is healthier than without***	23	26	2.6±1.1*	17	49	3.3±1.2 ^y	46	68	3.6±1.2 ^y
(i) Contain unnatural hormones***	43	48	3.4±1.0*	18	51	3.3±1.0 ^y	18	26	2.8±1.0 ^y
(j) Dairy products contain antibiotics***	45	50	3.5±0.9*	16	46	3.2±0.9 ^{xy}	13	19	3.0±0.9 ^y
(k) Dairy products give me mucus**	37	41	3.1±1.3*	13	37	2.9±1.2 ^{xy}	14	21	2.5±1.1 ^y

^aDietary patterns were self-defined.

^bMean on a scale of 1 to 5, where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree.

^cSD=standard deviation.

*, **, ***Group means differed significantly by analysis of variance (**P*<.05, ***P*<.01, ****P*<.001).

^yMeans within a row with different superscripts differed significantly by Scheffe's test (*P*<.05).

proportions consuming other dairy products at least weekly did not differ among groups. Finally, more vegetarians than nonvegetarians or former vegetarians consumed all plant protein sources at least weekly.

Participants in the qualitative aspect of the study had a median age of 32 years (range=20-47). Of the 15 women, 3 considered themselves vegan or nearly vegan, 5 were lacto or lacto-ovo vegetarian, 1 was pesco-vegetarian, 3 were previous vegetarians, and 3 had never followed a vegetarian diet. The current vegetarians had followed a vegetarian diet for a median of 8 years (range=0.5-42 years).

Dietary Change

In the survey instrument, current vegetarians were asked whether their diets had changed during the time they had been vegetarian. Sixty-three percent (n=56) reported including fewer animal products than when they first became vegetarian, 27% (n=24) had not changed, and 10% (n=9) now included more animal products. The current vegetarians who participated in the qualitative interviews reported similar changes: more than half had increasingly restricted their food choices over time. Most of these informants had become vegetarians by eliminating meat and poultry from their diets. As they learned more about vegetarian nutrition and "factory farming", they gradually reduced intake of dairy products and eggs, and in some cases, foods with animal-derived ingredients like rennet and gelatin. By contrast, 2 interview participants had become less restrictive over time. These changes were mainly precipitated by concerns about nutritional adequacy, although issues of convenience and food availability also were mentioned. Two other interviewees, both of whom had been vegetarian for more

than 25 years, could not recall changing the types of foods included in their diets.

Current vegetarian women responded to an open-ended question in the survey instrument about whether they planned to change their diet during the coming year. Forty-eight women (53%) planned to change, either to eat less (n=38) and/or more (n=30) of certain foods. The most common planned change was to use fewer dairy products, specifically identified by 18 women. Planned reductions in intakes of fat (n=5), fish and seafood (n=5), eggs (n=4), and poultry (n=3) were also identified. The most common foods targeted for increases were fruits and/or vegetables (n=9), soy products (n=8), organically grown foods (n=6), and beans and legumes (n=4). Two women stated that they planned to use more seafood.

Each of the 35 former vegetarians who completed the survey instrument indicated why she had resumed an omnivorous diet, and several provided multiple reasons. The most common category was health-related reasons (weakness, fatigue, anemia), cited by 10 women. This was followed by missing the taste of meat (n=8), changes in living situations (eg, moving back in with a meat-eating family, n=7), the perception that it was too time-consuming to eat well as a vegetarian (n=6), and specific nutrition concerns, such as not getting enough protein (n=5). The 15 former vegetarians who participated in the qualitative interviews described health concerns and lack of social support for vegetarianism as the main reasons for adding meat back into their diets. With regards to health concerns, they thought vegetarian diets might lack some key factors their bodies need. Protein was mentioned most frequently, but calcium, iron, and vitamin B-12 were also mentioned. Ex-

amples of the importance of social support for maintaining a vegetarian diet included one woman who resumed eating meat when she moved back home with her parents and another who found it easier to eat meat because most of her friends were not vegetarians.

Perceptions about Meat and Dairy Products

The extent to which participants agreed with statements about red meat and dairy products are shown in Tables 3 and 4, respectively. With the exception of a statement assessing concern about the amount of fat in red meat, responses to all statements about meat differed by dietary pattern ($P < .001$). Post-hoc testing revealed that for 7 of 11 statements, most of which addressed perceptions about the healthfulness or nutrient content of meat, vegetarians' responses differed from former vegetarians and nonvegetarians, who had similar responses (to simplify presentation, these are listed as items a through g in Table 3). For the remaining 4 statements, most of which addressed perceptions about possible contaminants (h through k in Table 3), responses of vegetarians and former vegetarians were similar, and both differed from nonvegetarians' responses.

Perceptions about dairy products did not vary as consistently by dietary pattern (Table 4). No group differences were detected for the beliefs that dairy products cause gas and bloating, taste good, or that it is easy to get enough calcium without using dairy products. Group differences were detected by analysis of variance for the remaining 8 statements: for 2, pairwise comparisons were not detected (too fattening to use often, high in saturated fat and cholesterol). Vegetarians differed from nonvegetarians for all remaining statements, while former vegetarians differed from vegetarians for 3 statements (good sources of protein and nutrients, not needed by adults, diets with dairy healthier than without) and from nonvegetarians for 1 statement (contain unnatural hormones).

In the qualitative interviews, about half the women said that meat is not healthful because they believe that conventionally produced meat contains hormones, antibiotics, additives, increased concentration of environmental contaminants, and/or "things that go into meat that we don't really know of." Almost half mentioned concerns about fat and cholesterol in red meat. Poultry and fish were generally perceived as better choices than red meat because of lower fat and cholesterol levels and, for some women, because fish and chicken were seen as less similar to humans than cows. Availability of free-range, nonmedicated, and/or organic poultry (and eggs) alleviated some women's concerns about animal treatment, hormones, antibiotics, and environmental contamination. Some participants, however, were particularly concerned about fish consumption because of increased concentration of environmental contaminants as well as depletion of fish stocks through over-fishing.

Beliefs about dairy products seemed to be more varied than beliefs about any other commodity group, both from one participant to another as well as within some individuals. Approximately equal numbers of interview participants had generally positive attitudes about dairy products, negative attitudes, or were trying to sort through positive and negative opinions. Those who saw dairy products as an important part of the diet talked about their calcium content and role in reducing osteoporosis risk. Most of these women noted that dairy products (especially cheese) can be high in fat, and therefore consumed them in moderation and/or chose lower

fat options. Women with negative opinions about dairy foods cited a variety of concerns, including the dairy industry's treatment of cattle and use of hormones and antibiotics, the idea that dairy products are for feeding baby cows rather than humans, and beliefs that dairy consumption produces mucus, bloating, or lack of energy in humans. Some women who discussed these concerns believed they could obtain adequate calcium intake from other foods and that consumption of animal foods, including dairy products, is detrimental to bone health because of the high protein intake. Other women believed that dairy products are the best calcium source in the diet, so sought to balance their concerns about these products with their beliefs about their importance.

DISCUSSION

The findings of this study add to our understanding of the food practices of self-defined vegetarian women, changes in their dietary practices over time, and specific beliefs about meat and dairy products that may underlie dietary change. The finding that more than half the current (self-defined) vegetarians in this study occasionally used fish emphasizes the lack of a universally accepted definition for the term *vegetarian* (22) and the need for caution in interpretation of this term (23). The occasional use of meat products by self-defined vegetarians is not unique to our study: in a representative Canadian sample, 78%, 60% and 20% of self-defined vegetarians "ever" ate fish, poultry, and red meat, respectively (2).

Regarding changes in vegetarian practices, although 27 of 90 vegetarians in our sample maintained stable dietary practices over time, 56 (including 4 of 6 vegans) seemed to progress along the vegetarian continuum, moving toward a more vegan diet (5). Particularly noteworthy was the substantial proportion planning to use fewer dairy products in the future. Even though most vegetarian participants consumed dairy products, as a group they consumed less fluid milk than nonvegetarians or former vegetarians. This may have implications for the vitamin D and calcium status of these women (24-26), unless fortified soy beverages are used as a milk replacement or intake of other calcium-rich foods increased.

Beliefs about the nutritional and health attributes of animal and plant foods have been associated with their consumption or avoidance (27,28). This association was evident in our sample, as reflected by vegetarians' and omnivores' different attitudes about meat and dairy products. However, even though former vegetarians and nonvegetarians tended to believe that meat and dairy products made important nutrient contributions to the diet, many women, including substantial proportions of nonvegetarians, had concerns about the value/quality of meat and dairy products. Reservations about these foods have occasionally been expressed (29,30), but they seemed to be more prevalent among our sample than in earlier studies, perhaps reflecting a general mistrust of the food supply. Some beliefs may be misperceptions, such as the belief that "meat is difficult to digest", or that dairy products contain antibiotics and other substances such as recombinant bovine somatotropin (rBST). (In Canada, antibiotic testing programs are rigorous, with large penalties for failure to comply, and rBST is not presently used). However, these misperceptions will not be simple to address, as they appear to be strongly subscribed to. Other beliefs may be accurate. For example, animal fat does contain toxins in measurable amounts, although opinions vary about whether the quantities detected have biological effects.

Educational resources from sources perceived as unbiased may help put this information in context for individuals.

Limitations of the study include the nature of the sample: because it was a convenience sample rather than a random sample of the population, the results cannot be generalized widely. Nevertheless, they do provide insight about the opinions and practices of well-educated urban women. Secondly, the subsample used for the qualitative portion of the study was small and was not selected to be representative of the larger group. Despite this, the findings were consistent with the quantitative data, and serve to better illustrate the strength, depth, and variability of beliefs.



APPLICATIONS

Because food-related motivations, opinions, and practices of women vary greatly, dietitians counseling female clients—whether vegetarian or not—should invest time to learn, in depth, about the type of diet followed as well the belief framework that supports it. Because dietary patterns often are not static, dietary changes the individual is considering should also be explored. With this information, advice appropriate to each individual can be provided, and suggestions that might be offensive can be avoided. For example, the approach taken with a woman considering omitting dairy products from her diet may differ depending on whether her motivations were related to concerns about health effects of saturated fat or to ethical concerns about treatment of dairy cattle.

The study's results also have implications for food producers and processors, particularly of animal foods. Many women in this study, whether vegetarian or not, were concerned about the safety of these foods (eg, presence of contaminants), and/or had concerns about animal welfare issues. Some of these concerns may be legitimate, while others may not. Regardless, addressing them will be a challenge, and will likely require a collaborative approach that includes food industry, government agencies, health agencies, and consumer groups.

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