# Optimistic bias and food

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Food consumption patterns are influenced by a number of factors, including social and cultural factors. It is difficult to effect dietary change, and one possible barrier to dietary change is optimistic bias. Research indicates that individuals tend to believe that they are less likely to experience negative events, and more likely to experience positive events than their peers; this phenomenon is known as optimistic bias. It has been argued that optimistic bias may have a negative impact both on self-protective behaviour and on efforts to promote risk-reducing behaviours. The present article reviews the literature investigating optimistic bias specifically in the food domain. The review indicated that many food and nutrition issues are associated with optimistic bias. This has important implications for health-promotion activities in the food domain. The paper also describes key aspects of the methodology used to investigate optimistic bias and details the conditions under which optimistic bias has been demonstrated. The importance of identifying the causes of optimistic bias is discussed, and empirical attempts designed to reduce optimistic bias by countering the causes are reviewed. Finally, directions for future research are suggested.

**Optimistic bias: Nutrition: Food: Health promotion**

## Introduction

Food consumption patterns are not solely determined by physiological and nutritional factors; social and cultural factors also play an important role (Shepherd, 1999). Specific psychological factors also influence food choice and the purpose of the present paper is to focus upon a psychological phenomenon termed optimistic bias. Previous research has found that individuals tend to believe that, in comparison with others, they are less likely to experience negative events, and more likely to experience positive events. This tendency is known as 'optimistic bias', or 'unrealistic optimism' (Weinstein, 1980). It should be noted that optimistic bias is a group effect; for some individuals claims of lower risk are not unrealistic, but not everybody's risk can be lower than other individuals'. If self–other risk comparisons (i.e. comparisons of personal characteristics, such as risk status, with the characteristics of other individuals) are not biased then claims of below-average risk should be balanced by claims of above-average risk. In a representative sample the mean response will be average. Thus, in a group situation, if the majority perceive themselves to be at lower risk than other individuals then this is unrealistic (Weinstein, 1989).

If individuals see themselves as less at risk from a given hazard than other individuals, then they may not be influenced by messages provided to the general population advocating a need to change behaviour, believing these messages to be aimed at others (Perloff & Fetzer, 1986; Weinstein, 1987, 1989; Frewer *et al.* 1998; Shepherd, 1999). It has been argued that optimistic bias may represent a barrier to effective risk communication, through individuals ignoring risk messages because they believe they are directed at a more vulnerable other and failing to take precautions regarding a hazard. If this is the case, then there are implications both for hazards where there are protective actions individuals can take that should reduce the likelihood of their suffering various adverse health effects (such as reducing intake of certain types of fat to lower the risk of CHD, or thoroughly cooking meat to avoid food poisoning), and for hazards associated with 'food scares'. In a 'food scare' situation, risk regulators may recommend certain actions; such as not eating raw eggs to protect against *Salmonella*, or washing fruit before eating it to protect against pesticide residues, or recalling products suspected to be contaminated. Some individuals may not undertake appropriate precautionary behaviour due to optimistic bias effects. When investigating public perception of five food-related hazards, Miles & Frewer (2001) found that some individuals expressed no concern, and described no behaviour change during the 1988 *Salmonella* in eggs scare, and

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the UK 1996 bovine spongiform encephalopathy (BSE) scare. Optimistic bias is a phenomenon which must be taken into account both by (a) researchers investigating public perceptions of food and nutrition issues and (b) health-promotion organizations seeking to communicate food safety and nutrition-related information to consumers.

The present paper presents a selective review of optimistic bias research in the food domain. In the context of the present article, two aspects of the food domain are considered: (1) the likelihood of suffering specific health effects associated with diet (such as high blood pressure and heart disease); (2) the likelihood of experiencing negative effects associated with potential food hazards (such as BSE or genetically modified foods). The review is supplemented with an analysis of the different methods used to measure optimistic bias. The strengths and weaknesses of each method are discussed and recommendations are made for future work in this area. The causes of optimistic bias are also discussed and interventions directed at reducing optimistic bias are described. Finally, implications of the empirical work reviewed are highlighted and recommendations for future health-promotion campaigns are presented.

## Optimistic bias in nutrition-related domains

Optimistic bias is associated with a variety of potential hazards and negative life events, such as: being the victim of a mugging, being injured in a fire, being in a car accident, becoming overweight, being injured whilst bungee jumping, committing suicide, having an unwanted pregnancy, suffering smoking-related diseases, suffering skin damage from the sun, getting AIDS or becoming infected with HIV, suffering food poisoning, getting cancer, suffering a heart attack, becoming an alcoholic, and getting tooth decay (for example, see Weinstein, 1980, 1982, 1984, 1987; Burger & Burns, 1988; DeJoy, 1989; Boney McCoy et al. 1992; van der Velde et al. 1992; Frewer et al. 1994; Whalen et al. 1994; Fontaine & Smith, 1995; Lek & Bishop, 1995; Middleton et al. 1996; Eiser & Arnold, 1999; Helweg-Larsen, 1999; Raats et al. 1999). This body of research has indicated that optimistic bias is not found for all hazards; nor is it found to the same extent for all hazards, even within particular hazard domains (for example, see Weinstein, 1980, 1982, 1987; Sparks & Shepherd, 1994).

Details of studies examining whether or not optimistic bias occurs in the food domain are reported in Table 1. (The initial pool of articles was identified by means of a literature search using the Web of Science with the search terms 'optimistic bias', 'unrealistic optimism', 'food', 'nutrition', 'diet'. Empirical work referred to in this initial pool of articles extended the number of studies available for review.) The first column lists the papers alphabetically, the second details the comparison method used and the comparison standard (described later; pp. 5–13 and pp. 13–14 respectively), the third column provides details of the study sample, the fourth column describes the response scale used, the fifth column describes the item used to measure optimistic bias and the target/s with whom the respondents are required to compare their risk status (described later; p. 13). The sixth column lists the nutrition-related hazards investigated for optimistic bias and the last column reports the

study findings, with significant results indicating that optimistic bias was found. It can be seen from the Table that relatively few studies have focused exclusively upon optimistic bias in the food domain. Instead, food-related comparative risk judgements have been elicited alongside judgements about a wider range of 'negative events' (including hazards such as smoking, contracting AIDS, being injured in a car accident). Notable exceptions are the studies published by Frewer, Sparks and colleagues (for example, Frewer et al. 1994; Sparks & Shepherd, 1994; Sparks et al. 1995; Paisley & Sparks, 1998; Raats et al. 1999), who have looked specifically at perceived risk and optimistic bias associated with food- and diet-related hazards. The following sections outline the extent to which optimistic bias has been shown to operate for (a) comparative risk judgements for negative health outcomes associated with aspects of diet (for example, personal risk of getting high blood pressure in comparison with the risk status of other individuals), and (b) comparative standing on risk factors associated with such negative outcomes (for example, how often individuals believe they perform behaviours, such as eating greasy food, in comparison with how often they believe other individuals perform these behaviours).

### Negative health outcomes associated with aspects of diet

Examination of the literature reported in Table 1 indicates that optimistic bias is typically found for the likelihood of suffering heart attacks and heart disease (however, see Weinstein, 1987), weight gain and obesity (however, see Weinstein, 1987), tooth decay (however, see Weinstein, 1980 (study 1), 1983, 1984 (studies 1 and 3)), drinking problems and liver disease or cirrhosis, gallstones, health effects associated with high-fat diets, diabetes (however, see Perloff & Fetzer, 1986 (study 1)), and food poisoning (however, see Sparks & Shepherd, 1994). The findings for cancer, stomach ulcers and high blood pressure are more equivocal. There does appear to be a tendency for stomach ulcers and high blood pressure not to be associated with optimistic bias and where optimistic bias is observed the effects tend to be small. With respect to cancer, whether or not optimistic bias is exhibited seems to be dependent on the type of cancer under investigation. For example, there is evidence of optimistic bias for lung cancer in smokers and non-smokers (Weinstein, 1982, 1987; Kulik & Mahler, 1987; Harris & Middleton, 1994; Lek & Bishop, 1995; Williams & Clarke, 1997), colon cancer (Rothman et al. 1996 (study 1)), cervical cancer (Eiser & Cole, 2002), skin cancer (Weinstein, 1982, 1987; Eiser & Arnold, 1999; Kos & Clarke, 2001), breast cancer (Clarke et al. 2000), and brain cancer (Lek & Bishop, 1995). For non-specified cancer, of the eighteen studies reported in Table 1 that have included this hazard, nine show no optimistic bias and seven show optimistic bias (two could not be assessed because the analysis was performed on the hazards combined). The inconsistency observed when considering the optimistic bias results for non-specified cancer could be because when asked to assess their risk standing on 'other cancer', different individuals are thinking about different types of cancer, or they are thinking about more than one

type of cancer. Further research needs to ensure that the hazard is clearly defined so that the researcher can be confident that all respondents are rating the same hazard.

### Optimistic bias about diet-related risk factors

Individuals show self-favouring biases for behavioural risk factors instrumental in the occurrence of health problems (Weinstein, 1984) (i.e. individuals believe that they perform risky behaviours less often than other individuals, and perform self-protecting behaviours more often). For example, Sparks *et al.* (1995) indicated that respondents claimed to eat less of the foods associated with high fat consumption than the average person. Such self-favouring biases have been observed for a number of risk factors and risk-increasing behaviours, including: eating red meat, eating greasy food, eating eggs, eating sweets, drinking alcohol, adding butter to food, perceived blood-cholesterol level, perceived amount of fat and cholesterol in the diet, perception of health consciousness (Perloff & Fetzer, 1986 (study 2); Klein & Kunda, 1993; Weinstein & Klein, 1995 (study 1); Klein, 1996). Results such as these have led to the conclusion that many individuals may misrepresent the actual content of their diet in line with their optimistic biases about risk. Raats & Sparks (1995) argue that such findings may account for some of the failure of nutritional messages as individuals may accept the general validity of such messages while at the same time believing them to be applicable to other individuals who eat more of the 'risky' food than them. For this reason, health-promotion campaigns in the food domain may need to make individuals aware of what they are eating, through feedback about diet, in addition to informing them about the risks.

Thus, it has been demonstrated that in addition to exhibiting optimistic bias about their likelihood of suffering adverse effects associated with various potential hazards, individuals are also biased about their standing on a number of risk factors linked to risk from these hazards. By way of providing a specific example, the next section focuses upon optimistic bias and health-promotion initiatives in the context of 'eating a high-fat diet'.

### Optimistic bias in the context of dietary fat intake

Current dietary advice in the UK is aimed at reducing intake of certain types of fat. In 1994 the Committee on Medical Aspects of Food and Nutrition Policy published a report that recommended that no more than 35 % of food energy intake should come from fat, and no more than 10 % should come from saturated fatty acids (Committee on Medical Aspects of Food and Nutrition Policy, 1994). Most individuals in the UK do eat more fat than recommended (British Nutrition Foundation, 1998). Reducing fat in the diet is thought to aid in the prevention of chronic diseases including obesity. Individuals who are obese are more likely to suffer from CHD, adult-onset diabetes, arthritis, gallstones, high blood pressure and some types of cancer (British Nutrition Foundation, 1998; Lowry *et al.* 2000; Peto, 2001). High fat intake (particularly saturated fatty acids) has also been associated with raised blood cholesterol level, which is one of the risk factors for CHD. CHD is the most common cause of death in the UK and a major cause of premature death (i.e. before age 65). In addition, there is some evidence of a relationship between high fat intake, obesity and increased risk of certain types of cancer (British Nutrition Foundation, 1998; Peto, 2001).

Studies that have been carried out in the context of dietary fat intake have indicated that optimistic bias may be a barrier to the initiation of health-protective dietary change. Optimistic bias effects have been found for comparative judgements about the likelihood of experiencing health problems related to having a high-fat diet. Sparks & Shepherd (1994) and Frewer *et al.* (1994) found optimistic bias for perceived risk associated with high-fat diets. Weinstein (1987) found significant optimistic bias for several health problems associated with high-fat diets (becoming overweight, having high blood pressure and suffering heart attacks). Sparks *et al.* (1995) assessed respondents' beliefs about their susceptibility to heart disease, weight gain and feeling unwell due to high fat consumption. They found optimism for all three of these measures. In addition, there is evidence that individuals are optimistic about their standing on risk factors associated with dietary fat intake, as well as being optimistically biased about the likelihood of suffering any negative effects (as described earlier; p. 5).

It can be surmised that optimistic bias appears to be a fairly pervasive phenomenon when individuals consider their comparative chances of experiencing nutrition-related health problems and also when they assess their standing on nutrition-related risk factors. Nonetheless, it is advisable to adopt a circumspect approach. There is evidence that different measurement procedures may sometimes be associated with the degree of optimistic bias obtained. The next section discusses this issue with particular reference to key studies in which food- and nutrition-related comparative risk judgements have been obtained.

## Measuring optimistic bias

Differences in question presentation across studies may mean that respondents in different studies use different information processing strategies in order to generate comparative risk judgements. In order to maximise the effectiveness of interventions in this domain, an understanding of the antecedent information processing strategies that give rise to optimistic bias as a function of the measurement procedure used is a necessary prerequisite.

### Indirect v. direct comparisons

Optimistic bias is typically assessed using either (a) the indirect method or (b) the direct method. The indirect method requires respondents to make likelihood judgements about personal risk for themselves on one item (for example, 'The likelihood of me getting X is … ') and likelihood judgements for other individuals on another item (for example, 'The likelihood of the average person, of my age and sex, getting X is … ') (Klein & Weinstein, 1997). A typical response scale for such items would be 1 = 'not at all likely', 4 = 'moderately likely', to 7 = 'extremely likely'. The direct method is more explicitly comparative. Here, respondents are required to make a likelihood judge-

**Table 1.** Details of studies that have investigated food hazards and nutrition-related health problems

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Astrom et al. (1999) (study 1) | Direct Other as standard | 140 Tanzanian women, aged 15–40 years (60 % aged 15–25) | 5 point scale: −2 = much below the risk of other women 0 = neither above nor below the risk of other women or same risk as other women +2 = much above the risk of other women | 'As compared to neighbouring women of your own age, how do you perceive your own risk for once in your lifetime experiencing X?' | Severe tooth decay<br>Gum disease<br>Loss of teeth<br>Having children with pitted, coloured and fractured teeth | $<0.001$<br>$<0.001$<br>$<0.001$<br>$<0.001$ |
| Astrom et al. (1999) (study 2) | Direct Other as standard | 1190 Norwegians, aged 25 years old (47·5 % women) | 7 point scale: −3 = much below the risk of others 0 = same risk as others +3 = much above the risk of others | 'As compared to other people of your own age and gender how do you perceive your own risk for once in your lifetime experiencing X?' | Severe tooth decay<br>Gum disease<br>Needing dentures | $<0.001$<br>$<0.001$<br>$<0.001$ |
| Dolinski et al. (1987) | Indirect Other as standard and self as standard | Eighty-two female, Polish introductory psychology students | 11 point scale: Ends labelled as 'entirely impossible' and 'entirely certain' | Respondents asked to estimate the probability that the negative life event would happen to her and to the average female student of a similar age | Six negative life events, including:<br>Having a heart attack<br>Developing cancer | $<0.05$ and $0.06$<br>NS |
| Fontaine & Smith (1995) | Indirect Other as standard and self as standard | Forty-three working class British (seventeen male and twenty-six female, age range 21–60, mean 38) and sixty-one lower-middle class Americans (sixteen males and forty-five females, age range 19–79, mean 40·4) | 11 point scale: 0 = never, 10 = certain | Respondents asked to rate the likelihood of developing cancer for themselves and the average person | Likelihood of developing cancer | $<0.02$ |
| Frewer et al. (1994) | Indirect Other as standard and self as standard | 186 UK consumers (questionnaires mailed to 300) | 100 mm linear analogue scale, anchored by 'none at all' and 'a great deal' | Respondents asked to rate risk for themselves, other people and society | Ten food-related hazards:<br>Alcohol abuse<br>High-fat diet<br>Food poisoning (home-prepared food)<br>Food poisoning (food prepared by others)<br>Microwaves<br>Food irradiation<br>Pesticides<br>GM of animals<br>GM of micro-organisms<br>GM of plants | †<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$ |
| Harris & Middleton (1994) | Indirect (between-subject) | 192 University of Hertfordshire, UK undergraduate students. 133 males and fifty-nine females. Mean age 21 (SD 3·33) years | 8 point rating scale: 0 = will not get, extremely unlikely, very unlikely, unlikely, likely, very likely, extremely likely 7 = will get | Respondents rate likelihood of getting medical conditions in next 5 years for one of four targets: themselves, their acquaintance, their friend's friend, and the typical Hatfield student of their sex | Fifteen medical conditions, including:<br>Stomach ulcers<br>High blood pressure<br>Obesity<br>Liver trouble<br>Heart trouble<br>Stroke | †‡<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$<br>$<0.05$ |

**Table 1.** continued

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Hoorens (1995) | Direct Other as standard and self as standard | Ninety-two Dutch high-school students aged 15–18 years. Forty-seven males and forty-five females | 9 point scale: 1 = extremely less chance 9 = extremely more chance | Half the respondents estimate the chance that the average student of the same age, sex and school would experience each event, compared with themselves. Half the respondents estimate the chance that they would experience each event, compared with the average student of the same age, sex and school | Seventeen positive and seventeen negative future events, including: Heart attack Cancer | Combined |
| Hoorens & Buunk (1993) | Indirect Other as standard and self as standard | Eighty-four Dutch high-school students, aged 15–18 years. Thirty-five males and forty-nine females | 101 point scale: 0 chance (certainty that the event won't happen) to 100 | Respondents asked to evaluate the chances of them and a target (average high school student, an arbitrary high school student, their best same-sex friend) experiencing the hazards | Five hazards, including: Getting a drinking problem Having a heart attack before the age of 40 Getting cancer | $<0·001$ $<0·05$ NS and 0·005 |
| Klein (1996) (study 2) | Direct Other as standard | 390 undergraduates at Colby College, US. 62 % female | 7 point scale: 1 = much below average 7 = much above average | Respondents estimate their risk compared with target other (average, same-age, same-sex, Colby College undergraduate) | Heart disease Alcoholism | $<0·001$ $<0·001$ * |
| Kulik & Mahler (1987) | Direct Other as standard | 110 students at the University of California at San Diego, US. Sixty-seven healthy (twenty-three males and forty-four females). Forty-three ill (twenty-one males and twenty-two females) | 15 point scale: −7 = much less likely than other people 0 = average +7 = much more likely than other people | Respondents compare themselves with other people. 'Compared with other people, the same sex and age as you, what do you think are the chances that each of the following events will happen to you?' | Ten problems (six health and four non-health), including: Heart attack Ulcer Other cancer Tooth decay | ¶ $<0·001$ $<0·05$ $<0·01$ $<0·001$ |
| Lek & Bishop (1995) | Direct Other as standard | Seventy university undergraduates. Fifty males and twenty females. Mean age 25·8 (range 18–28) years. 96 % Chinese | 7 points scale: −3 = much less likely +3 = much more likely | Respondents compare self with peers. 'When you compare yourself to your peers, what are your chances of getting X?' | Eleven diseases, including: CHD Gastritis | $<0·01$ $<0·10$ |
| Miles (2001) | Direct Other as standard | 233 members of the UK public. 74 % female. Mean age 44·8 (SD 14·9) years | 7 point scale: +3 = I am much more at risk than other people 0 = my risk is the same as other people −3 = I am much less at risk than other people | Respondents rate comparative risk. 'Compared to typical other people of your gender, age and education level in the UK population, what do you feel is the health risk to you personally from X?' | Five food-related hazards: BSE (in beef and beef products) Genetic modification of food High-fat diets Pesticide residues in food Salmonella food poisoning | * $<0·01$ $<0·05$ NS NS $<0·001$ |
| Myers & Brewin (1996) (study 1) | Direct Other as standard | Eighty female students from Birkbeck College, UK (selected from pool of 160). Age range 18–58 (mean 35·1) years | 5 point scale: 1 = much below average, below average, average, above average, 5 = much above average | Respondents rate likelihood of certain events happening to them compared with fellow students | Fifteen events (ten negative and five positive), including: Having a heart attack Having a decayed tooth extracted Developing cancer | Combined |

**Table 1.** *continued*

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Paisley & Sparks (1998) | Indirect. Standard not known | 152 self-selected respondents from Reading, UK. 18–65 years, mean 34 years. Thirty-eight males and 114 females | 7 point scale extremely low–extremely high | 'Do you think your dietary fat intake is …', 'Do you think the average person's fat intake in Britain is …', 'Do you think that the fat intake of people you know is …' | Fat intake | <0·001 ‡ |
| Perloff & Fetzer (1986) (study 1) | Indirect. Other as standard and self as standard | 101 introductory psychology students, University of Illinois, US. Forty-eight males and fifty-three females | 7 point scale: 1 = not at all likely 7 = extremely likely | Respondents asked how likely it was that they and one comparison target (the average person of your sex; the average college student of your sex at the University of Chicago, Illinois; your closest friend; the sibling closest to you; your same-sex parent) would experience the negative life event sometime during their life | Ten negative life events, including: Cancer Heart attack Drinking problem Diabetes | ‡ <0·05 <0·01 <0·001 NS |
| Perloff & Fetzer (1986) (study 2) | Indirect. Other as standard and self as standard | 190 introductory psychology students, University of Illinois, US. Ninety-one males and ninety-nine females. A = 83, B = 107 | 7 point scale: 1 = not at all likely 7 = extremely likely | Respondents asked to rate their personal likelihood of the event happening. Then asked to rate one of three targets (the average college student of your sex at the University of Illinois at Chicago, your closest friend, or one of your friends (a different friend for each event)) | Four problems, including: Heart attack Drinking problem Cancer | ‡ <0·01 <0·001 <0·001 |
| Peterson & De Avila (1995) | Indirect (direct scale). Other as standard | Eighty-six volunteers (US). Forty-three males and forty-three females. Mean age 22·1 (SD 7·89) years | 7 point scale: –3 to +3 with midpoint of 'average for men or women my age' | Respondents asked to rate perceived personal risk, compared with a midpoint referring to 'men/women my age' | Eleven problems, including: Heart attack Food poisoning Alcohol problem Stroke | † <0·05 <0·05 <0·05 <0·05 |
| Raats et al. (1999) | Indirect. Standard not known | 171 staff of Oxford Brookes University, UK. 115 completed all phases. Forty-four males and seventy-one females | 9 point scale: 1 = extremely unlikely 9 = extremely likely | 'How likely do you think you are to experience or get the following X at some time in the future, because of the amount of fat in your diet?' Also phrased in terms of the 'average other of your sex and age in Great Britain' | Heart disease Cancer Ill-health Indigestion Weight gain | <0·001 <0·001 <0·001 <0·001 <0·001 |
| Regan et al. (1995) (study 1) | Direct. Other as standard | Twenty-seven introductory psychology students, University of Minnesota, US. Nine males and eighteen females. Mean age 19·19 years | 9 point scale: –4 = extremely below average, much below average, below average, a little below average, 0 = average, a little above average, above average, much above average +4 = extremely above average | Respondents compare chances of experiencing life events with the chances of three targets (other University of Minnesota students of same sex, closest same-sex friend, university acquaintance) | Eighteen life events (nine positive, nine negative), including: Gaining 30 lbs Heart attack by 40 Having a drinking problem | <0·001 <0·01 <0·001 |

**Table 1.** *continued*

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Rothman *et al.* (1996) (study 1) | Indirect Other as standard and self as standard | 171 undergraduates at Rutgers University and 101 at Colby College, US. 53 % males and 47 % females | 0 % (no chance) to 100 % (certain to happen) The listed choice increased in units of 0.1 % from 0 % to 1 %, then increased in units of 1 % to 20 % and finally increased in units of 10 % from 20 % to 100 % (38 points) | Respondents asked to rate the chance they and the 'average college-educated woman/man' would experience the hazards some time in the future. 'What do you think is the chance that you/ other will become X sometime in the future' | Fourteen hazards, including: Chronic liver disease or cirrhosis Colon cancer Alcohol abuse or dependence Obesity (20 % over ideal body weight) | <0.001 <0.001 <0.001 <0.001 |
| Sparks & Shepherd (1994) | Indirect (direct response scale) Other as standard | 800 questionnaires sent to members of UK consumer panel. 216 returned. Thirty-one males, 183 females and two no gender indicated | 7 point scale: much less than most people, same as most people, much more than most people | Respondents asked to rate the extent they think they are personally at risk from the potential hazards, compared with most people | Twenty-five food hazards: Environmental contamination Pesticide residues Veterinary drug residues GM (plants) GM (animals) Natural toxicants Bovine somatotrophin Hormone residues BSE Packaging materials Listeria Bacterial contamination Food additives Salmonella Food irradiation Food colourings Artificial sweeteners Nutritional deficiencies Caffeine Vitamin C deficiency Microwave ovens Alcohol Excessive energy intake High-sugar diet High-fat diet | † NS NS NS NS NS NS NS NS <0.001 NS NS <0.001 <0.001 NS <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 |
| Sparks *et al.* (1995) | Direct Other as standard | 612 UK respondents 269 males, 342 females and one no gender indicated | 7 point scale: two versions Version 1: 'much below average', through 'average' to 'much above average' Version 2: 'much lower', through 'same' to 'much higher' | Respondents asked to compare their chance of experiencing the effects with others. 'Compared with other people of my sex and age my chances in the future of X because of high fat consumption are…' | Three health effects of high fat consumption: Getting heart disease Putting on weight Feeling unwell | <0.001 <0.001 <0.001 |

**Table 1.** *continued*

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Weinstein (1980) (study 1) | Direct Other as standard | No details provided | 15 point scale: 100 % less (no chance), 80 % less, 60 % less, 40 % less, 20 % less, 10 % less, average, 10 % more, 20 % more, 40 % more, 60 % more, 80 % more, 100 % more, 3 times average, 5 times average | Respondents compare the chance of each event happening to them with other students. 'Compared with other Cook students, same sex as you, what do you think are the chances that the following events will happen to you'. | Eighteen positive and twenty-four negative life events, including:<br>Heart attack before age 40<br>Having a heart attack<br>Decayed tooth extracted<br>Having gum problems<br>Developing cancer | <br><0·001<br><0·001<br>NS<br><0·01<br>NS |
| Weinstein (1980) (study 2) | Direct Other as standard | 120 female introductory psychology students, Rutgers University, US | 15 point scale as used in study 1 above | Respondents compare the chance of each event happening to them with other Cook students, same sex as them using the same item as study 1 | Twenty-six of the events from study 1, including:<br>Heart attack before age 40<br>Having a heart attack<br>Decayed tooth extracted<br>Having gum problems | Combined |
| Weinstein (1982) | Direct Other as standard | 100 members of an introductory psychology class at Rutgers University, US. Forty-six males and fifty-four females | 7 point scale: −3 = much below average, below average, slightly below average, average for other Rutgers students of your sex, slightly above average, above average +3 = much above average | Compared their risk with that of other college students at respondent's university | Forty-five illnesses and causes of death, including:<br>Alcoholism<br>Being 40 or more lbs overweight<br>Diabetes<br>Gallstones<br>Gum disease<br>Tooth decay<br>Vitamin deficiency<br>Heart attack<br>High blood pressure<br>Cancer<br>Ulcers | <br><0·001<br><0·001<br><0·001<br><0·001<br><0·01<br><0·05<br><0·05<br><0·05<br>NS<br>NS<br>NS |
| Weinstein (1983) | Direct Other as standard | Eighty-eight introductory psychology students, Rutgers University, US. Thirty-two males and fifty-six females | 7 point scale: much below average, below average, slightly below average, average for Rutgers students, slightly above average, above average, much above average (−3 to +3) | Respondents compare their chances of experiencing the risks with other students of the same sex at the same university. 'Compared with other Rutgers students of my sex, my chances of developing X are…' | Eleven health and safety risks, including:<br>Diabetes<br>Heart attack<br>Drinking problems<br>Other cancer<br>Ulcer<br>Tooth decay<br>High blood pressure | *<br><0·001<br><0·001<br><0·001<br>NS<br><0·05<br>NS<br>NS |
| Weinstein (1984) (study 1) | Direct Other as standard | US Group A: Seventy college students, twenty-six males and forty-four females Group B: introductory psychology students, sixteen males and forty-three females | 7 categories: Asked to imagine that college students had been divided into several equal size groups in terms of their risk of experiencing a particular health or safety problem in future. Subjects asked which group they thought they would fall into | Compare own perceived risk with that of their same-sex classmates | Twenty-three risks, including:<br>Alcoholism<br>Tooth decay<br>High blood pressure<br>Gum disease<br>Heart attack<br>Cancer<br>Diabetes | <br><0·001<br>NS<br>NS<br><0·001<br><0·001<br>NS<br><0·001 |

**Table 1.** *continued*

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Weinstein (1984) (study 2) | Direct Other as standard | Random sample drawn from all undergraduates at Cook College, Rutgers University, US (n 136). Sixty-three males and seventy-three females | 7 point scale: −3 = much below average, below average, slightly below average, average for Cook students, slightly above average, above average, +3 = much above average | Compared likelihood with other students at same university. 'Compared with other Cook males/females, my chances of having X in the future are:…' | Twelve health and safety risks, including: Tooth decay / Heart attack / Alcoholism / Diabetes / High blood pressure / Cancer / Gum disease | <0·001 <0·001 <0·001 <0·001 <0·01 NS <0·001 |
| Weinstein (1984) (study 3) | Direct Other as standard | Seventy environmental psychology students at Rutgers University, US. Twenty-seven males and forty-three females | 7 point scale: −3 = much below average, below average, slightly below average, average for Rutgers students, slightly above average, above average, +3 =much above average | Compared likelihood with other students at same university. 'Compared to other Rutgers students of my sex, my chances of getting X in the future are…' | Ten risks, including: Diabetes / Heart attack / Tooth decay / Drinking problems / High blood pressure / Other forms of cancer | † <0·05 <0·05 NS <0·05 <0·05 NS |
| Weinstein (1987) | Direct Other as standard | Adult residents (18–65 years) of households in New Jersey, US. Final sample 296, 49·4 % males | 7 point scale: −3 = much below average, below average, a little below average, average for men or women my age, a little above average, above average, +3 = much above average | Respondents asked to compare their chances of getting the problem with other men or women their age. 'Compared to other men/women my age, my chances of getting X in the future are…' | Thirty-two life hazards, including: Drinking (alcohol) problem / Food poisoning / Gallstones / Gum disease / Tooth decay / Ulcer / Diabetes / Overweight 30 or more lbs / Stroke / Heart attack / High blood pressure / Cancer | <0·001 <0·001 <0·001 <0·001 <0·001 <0·001 <0·01 NS NS NS NS NS |
| Weinstein & Klein (1995) (study 1) | Direct Other as standard | Households in New Jersey, US. 222 respondents. 51·1 % female. Median age 39 years | 7 point scale: −3 = much below average +3 = much above average | Respondents compare themselves with other men or women their age and indicate the relative likelihood that they would experience the problem in the future. | Three hazards, including: Having a heart attack | <0·002 |
| Weinstein & Klein (1995) (study 2) | Indirect Self as standard | Individuals at Rutgers University campus, US. 164 respondents. 57·2 % female. | 12 point scale: ranging from no chance, to certain to happen | Respondents answer absolute risk questions for self and the average student at the same university | Heart disease / Alcoholism | Sig Sig |
| Weinstein & Klein (1995) (study 3) | Indirect and Direct Other as standard | 190 undergraduates at Colby College, US (n 90) and Rutgers University, US (n 100). 73 % female | Indirect: 11 point scale: 0 = no chance 10 = certain to happen Direct: 7 point scale: −3 = much below average +3 = much above average | Indirect: Respondents answer absolute risk questions for self and other students (average college student) Direct: Respondents compare self with other students (average college student) and indicate the relative likelihood that they would experience the problem in the future | Becoming seriously overweight (30 or more lbs overweight) | <0·0001 |

**Table 1.** *continued*

| Researchers | Method | Sample | Response scale | Measure of optimistic bias and comparison target | Food or nutrition hazard | Significance (P) |
|---|---|---|---|---|---|---|
| Weinstein & Lachendro (1982) | Direct Self as standard | Seventy-six introductory psychology students. Thirty-six female and forty male | The proportion of other students whose chances of experiencing the event were greater than and less than the chances of the respondent – both figures to total 100 % (mean percentage of other students with greater chances should be 50 %, value above this indicates optimistic bias) | Asked to estimate the proportion of other students at the college (same sex) whose chances of experiencing the event were greater than and less than the chances of the subject himself or herself | Six problems, including: Having a heart attack before you are 40 years old | Combined |
| Whalen *et al.* (1994) (study 1) | Indirect Other as standard and self as standard | 244 sixth-grade children. 123 male and 121 female. Age range: 10–13 years | 10 point scale: endpoints labelled: 'will not happen' and 'will happen'; the anchors on either side of the midpoint were 'might not happen' and 'might happen' | Respondents asked to rate the chances of the events happening to them, and to a typical person. 'What are your chances? Will this happen to you?' Think of other people your age. What are the chances this will happen to a typical person?' | Nineteen events (six health, six lifestyle behaviours, seven physical and social environmental hazards) including: Heart attack Cancer Too much alcohol Unhealthy foods | Sig Sig Sig Sig |

GM, genetic manipulation; BSE, bovine spongiform encephalopathy; Combined, analysis conducted on hazards combined, so no significance values reported for individual hazards; Sig, authors report significant optimistic bias, but significance values not reported.

* Study involved experimental conditions, data for control reported.
† Significance level as shown was the only level reported.
‡ Study contained multiple comparison targets, significance level for comparison of self with average target reported.
¶ Study contained multiple respondents groups, significance level for combined sample reported.

ment for themselves in relation to others on a single scale (for example, 'Compared to the average person, of my age and sex, the likelihood of me getting X is … '). The response scale for such an item might be –3 = 'much less likely than the average person', 0 = 'as likely as the average person', to +3 = 'much more likely than the average person'. An average comparative rating (when using the direct method), or difference score (when using the indirect method), significantly less than zero (or below the mid-point of the scale) is taken as evidence of optimistic bias (Otten & van der Pligt, 1996). The main advantage of the indirect procedure is that when evaluating the effects of interventions designed to reduce optimistic bias it is possible to assess whether the intervention has affected self-ratings (i.e. ratings of personal risk) or other-ratings (i.e. ratings of other individuals' risk), which is not possible with the direct method. The main advantage of the direct procedure is that it is simple and straightforward (Klein & Weinstein, 1997).

While few studies utilise more than one method to assess optimistic bias, making comparisons between methods difficult, Otten & van der Pligt (1996) used both the direct and indirect methods in their empirical investigation. They investigated a range of hazards (including one related to alcohol consumption) and reported that direct measurement procedures tended to yield more optimism than indirect ones. However, in a study investigating optimistic bias for tornados, Weinstein *et al.* (2000) found more optimistic bias using an indirect method. The reason for this difference is not currently known, but whichever procedure is used it is important to be aware that additional, sometimes subtle, methodological variations may provide a context for, and so influence, comparative likelihood judgements. The second column of Table 1 lists the method used to assess optimistic bias for each of the studies described. Both methods have been utilised in the reported studies, but there is a slight tendency for direct measures to be used when investigating optimistic bias in the food domain. Inspection of results shown in the seventh column of Table 1 indicates that when direct measures are used optimistic bias is found in sixty-two out of eighty-three cases (75 %). When indirect measures are used optimistic bias is found in fifty-two out of sixty-seven cases (78 %). In short, in the studies reviewed here, there is little difference in the frequency with which bias is uncovered as a function of the measure used (i.e. direct *v.* indirect). However, it should be noted that four studies (utilising direct measures) were excluded from this count (Weinstein, 1980, (study 2); Weinstein & Lachendro, 1982; Hoorens, 1995; Myers & Brewin, 1996 (study 1)) because only combined significance levels were reported.

### Specification of comparison targets

Klein & Weinstein (1997) have pointed out that the comparison targets with which respondents are asked to compare themselves may vary in specificity, concreteness and level of individuation. Much research in this area asks respondents to compare themselves with the 'average' or 'typical' member of some reference group, as can be seen in the fifth column of Table 1. The degree of optimistic bias obtained may be related to the latitude which respondents

have been allowed in their interpretations of the person with whom they are comparing themselves. A vague comparative target (for example, the average student) can be interpreted, or conceptualised, in any number of ways but a highly specific comparative target (for example, your mother) does not afford the same degree of interpretative freedom.

Perloff & Fetzer (1986) investigated individuals' estimates of their comparative vulnerability to a series of negative events, several of which were nutrition-related (hypertension, cancer, heart attack, drinking problem, and diabetes). Results indicated that optimistic bias operated when the comparison target was an 'average' member of some reference group but not when it was a specific concrete target (i.e. closest friend, closest aged sibling, same-sex parent). Results also indicated that in relation to 'the average student' and 'one of your friends' respondents saw themselves as having lower egg, red meat and cholesterol intakes and a similar pattern emerged for the drinking- and cancer-related risk factors. However, other authors have not obtained comparable results; for example Hoorens & Buunk (1993) investigated whether or not optimistic bias operated for five hazards, three of which were nutrition-related (getting a drinking problem, having a heart attack before the age of 40, and getting cancer). Target others were 'the average high school student', 'an arbitrary high school student' or their 'best same-sex friend'. Results indicated that optimistic bias operated for all five hazards but that the nature of the comparison other was not associated with the level of optimism obtained. The interested reader is referred to Klein & Weinstein (1997), and to Harris *et al.* (2000) for further reading about target specificity.

Future research should examine the extent to which level of target specificity, concreteness and individuation impact upon levels of optimistic bias obtained in food- and nutrition-related domains. Moreover, investigating how individuals make comparative personal risk ratings within the confines of a particular questionnaire is one matter but investigating which targets individuals tend to compare themselves with when making decisions in real life may be quite another. Supplementing existing work with an improved understanding of individuals' real-life comparison preferences should provide additional valuable information to designers of nutrition-related health-promotion packages.

### Self-as-standard *v. others-as-standard*

Research suggests that the cognitive representations we hold of ourselves differ from the cognitive representations we hold of others. Tversky (1977) proposed that the cognitive representations we hold of ourselves are characterised by (a) a greater number of features, and (b) a larger proportion of unique features, than the cognitive representations we hold of others. It follows that when the self is compared with others, the self seems more unique and less similar to others. In contrast, when others are compared with the self, the others seem less unique and more similar to the self (Otten & van der Pligt, 1996).

When individuals make judgements about, for example, their personal risk status relative to other individuals' risk

status, the other individuals are the 'comparison standard' (in other words, individuals are judging their own risk in comparison to the risk of other individuals). When individuals make judgements about other individuals' risk status relative to their own risk status, the self is the comparison standard (Otten & van der Pligt, 1996). Under the indirect procedure the comparison standard is determined by the order in which the probability judgements are elicited (i.e. if likelihood of personal risk is rated before likelihood of risk for other individuals, then self is the comparison standard). Under the direct procedure, the comparison standard is determined by how the question is worded (i.e. if individuals are asked to rate their own risk in comparison to other individuals, then other individuals are the comparison standard; for example, 'Compared to other people of your age and gender, what is the likelihood of you getting X?'). The data reported in the fifth column of Table 1 indicates that for most of the studies other individuals are the comparison standard.

There is some evidence that the comparison standard affects the degree to which optimistic bias is exhibited. Otten & van der Pligt (1996, study 1) indicated that, using the indirect method, eliciting judgements first for others and then for the self (i.e. others-as-standard) resulted in a higher degree of optimism being obtained than when likelihood judgements were elicited first for the self and then for others (i.e. self-as-standard). This effect was not replicated in a second study (Otten and van der Pligt, 1996, study 2). In study 2, Otten and van der Pligt also examined the effects of comparison standard using the direct method, and emergent data indicated that more optimism was obtained using an others-as-standard perspective ('compare self to others') than when a self-as-standard perspective ('compare others to self') was used. However, results reported elsewhere (Hoorens, 1995) have indicated that an others-as-standard perspective only yields a higher degree of optimism than a self-as-standard perspective for positive events, not for negative events. In light of this finding, Hoorens (1995; p.814) suggested that positive and negative self-favouring biases 'are partially independent phenomenon, perhaps even calling for differential explanation and having different consequences'. Health-promotion campaigns often address both the positive and negative events associated with performance or non-performance of specific self-protective behaviours relevant to health. Given the importance of this issue, future food- and nutrition-related optimistic bias research should further investigate the impact of comparison standard on the degree of optimistic bias obtained for both positive and negative events.

### Implications of measurement issues for food- and nutrition-related domains

The influence of context effects, such as those described, might lead one to question whether methods of investigating optimistic bias are measuring an actual phenomenon. However, three arguments suggest that optimistic bias really does exist. First, optimistic bias is found for some hazards, but not for others when rated by the same respondents and the same optimistic bias item. Second, many hazards have been investigated using both indirect and direct methods, and have exhibited optimistic bias under both

methods. Third, optimistic bias has been exhibited using a between-subjects version of the indirect method (in other words, different individuals rate their own risk and other individuals' risk). Thus, while it would be inappropriate to conclude that the degree of optimism obtained in the food domain has been in large part a function of the measurement procedures adopted, researchers are urged to conduct empirical comparisons of different measurement procedures in nutrition-related domains. The interested reader is referred to the recent review by Helweg-Larsen & Shepperd (2001) for more detail about factors that moderate the extent to which individuals exhibit optimistic bias. While consideration of measurement issues is important, it is also necessary to consider optimistic bias at a more fundamental level. To this end, the next section describes the factors that may underlie, or cause, optimistic bias. Thorough understanding of the causes of optimistic bias is a necessary prerequisite for the design of effective communications in this domain.

### Causes of optimistic bias

Several determinants of optimistic bias have emerged from empirical work conducted on optimistic bias associated with various hazards over the past 20 years. For example, it has been found that optimistic bias is lower for problems perceived to be more likely to occur (Weinstein, 1987; Eiser *et al*. 1993), for problems that individuals have had some experience of (Weinstein, 1987; van der Velde *et al*. 1992; Lek & Bishop, 1995) and for problems to which more thought has been given (Eiser *et al*. 1993). There is some evidence that individuals exhibit more optimistic bias about problems they believe they can control (Weinstein, 1980, 1982, 1987; Kulik & Mahler, 1987; DeJoy, 1989; van der Velde *et al*. 1992; Hoorens & Buunk, 1993; Harris, 1996; however, see Harris & Middleton, 1994; Lek & Bishop, 1995; Welkenhuysen *et al*. 1996). Furthermore, optimistic bias has been demonstrated for problems associated with the belief that if the problem has not yet appeared, it is unlikely to occur in the future (Weinstein, 1982, 1987). Optimistic bias has also been found for hazards where there is a salient stereotype of an 'at risk person' (Weinstein, 1980). In addition, perceived similarity to this stereotype is associated with more perceived personal risk (Lek & Bishop, 1995). However, optimistic bias has not been found to be related to perceived severity (van der Velde *et al*. 1992; Welkenhuysen *et al*. 1996), or for the level of knowledge concerning the risk (Welkenhuysen *et al*. 1996).

Much of the research investigating factors associated with optimistic bias has combined results for all of the hazards assessed. Individual measures of, for example, the severity of each hazard are often not available (the literature on perceived control is something of an exception; see Harris, 1996). Consequently it is difficult to predict which hazards are likely to be associated with optimistic bias, and which hazards are not. For the findings of such research to be really useful to those working in food- and nutrition-related domains, more research is required to elucidate the standing of specific food-related health hazards on these factors. Thus, if we know that food poisoning is rated as controllable, associated with a salient 'at risk person',

judged to be unlikely to occur and a hazard that individuals have had little experience with, and given little thought to, then we could predict with some confidence that it will be associated with optimistic bias; this, in turn, could impact on the formulation of risk communication messages. It is important to understand the causal factors which may be implicated in the occurrence of optimistic bias for food hazards and nutrition-related health problems. Weinstein has argued that a number of different factors could underlie optimistic bias and these can be categorised as either motivational or cognitive; these causal explanations will be detailed in the next section (Weinstein, 1980, 1982, 1987, 1989).

### Motivational explanations

Motivational explanations basically assume that individuals are motivated to make risk judgements that will not induce negative affect or threaten self-esteem, and so will maintain or promote psychological wellbeing. Optimistically biased risk judgements may be the outcome of a process of 'defensive denial' where individuals attempt to avoid the anxiety one would feel from admitting a threat to personal wellbeing (Weinstein, 1989). If this were the case, it might be expected that hazards rated high in seriousness (i.e. more threatening), or causing a lot of worry should elicit more optimism than less serious, less worrying hazards. However, Weinstein (1989) notes that most data do not support this because life-threatening hazards exhibit no greater optimism than minor illnesses, nor is optimistic bias related to the threat value of a hazard (for example, Weinstein, 1980, 1982).

It has also been argued that optimistic bias may be the outcome of individuals' attempts to maintain self-esteem (Weinstein, 1989). Admitting that other individuals are less susceptible to harm than the self may threaten feelings of competence and self-worth. This cause of optimistic bias would really only be appropriate for preventable or controllable hazards. Being vulnerable to hazards that no one can control should present no threat to self-esteem. This would lead to the prediction that the more preventable the hazard the greater the tendency to claim below average risk, a prediction which has been supported in the literature (for example, Weinstein, 1980, 1982, 1987; van der Velde *et al.* 1992).

### Cognitive explanations

Cognitive explanations for optimistic bias have tended to emphasise inadequacies in human information processing capabilities (Weinstein, 1980). Individuals may process risk-relevant information in a manner that introduces systematic errors.

The egocentric explanation of optimism is based on the notion that individuals often find it difficult to adopt the perspective of others. When they think of the actions that they take to prevent harm, they may fail to ask themselves whether or not their peers also take these precautions. Individuals focusing only on their own risk-relevant characteristics may incorrectly conclude that their chances differ from those of others (Weinstein, 1980). Weinstein (1980) has asserted that if optimistic bias arises from an egocentric information processing strategy, then any information that affects an individual's beliefs about their own chances could also influence their comparative risk judgements.

Weinstein (1980) has also suggested that an individual's past experience may influence their likelihood judgements. 'Personal experience should make it easier to recall past occurrences of the event and to imagine situations in which the event could occur, leading to greater perceived probability through the mechanism of 'availability' (Tversky & Kahneman, 1973, 1974)' (cited in Weinstein, 1980, p.807). Events that are easily recalled from memory tend to be judged to have a higher probability of occurrence than less easily imagined ones (for a discussion, see Eiser & van der Pligt, 1988). Weinstein (1980) also asserts that past experience involving a particular event may be taken to imply that future experience with that event is more likely to occur. The converse is also true, in that having not experienced a particular event may lead individuals to assume that they will not experience that event in the future. For example, not having had a heart attack in the past may lead individuals to conclude that their own chances of having a heart attack in the future are below average.

A third cognitive explanation for optimistic bias is that it could be the outcome of individuals comparing themselves with a salient stereotype (Weinstein, 1980; Weinstein & Klein, 1995). Individuals may incorrectly conclude that their risk from an event is below average by comparing themselves with a salient high-risk group, rather than to individuals like themselves. It may be that individuals have a stereotypical idea of the type of individuals to whom different problems will occur. If they do not see themselves as fitting the stereotype, it is suggested that individuals will conclude that the event will not happen to them, and overlook the fact that few of the individuals to whom they are comparing themselves, and those who experience the event, may actually fit the stereotype. Weinstein (1980) did find that problems associated with a vivid victim stereotype were more likely to evoke optimistic bias than problems without an associated stereotype.

### Linking motivational and cognitive explanations

The cognitive and motivational explanations just outlined should not be viewed as competing because cognitive and motivational processes may well be linked, rather than exclusive. Kunda (1990) has argued convincingly that motivational goals may influence the outcome of reasoning tasks via reliance on specific cognitive mechanisms. In support of this notion, empirical work has indicated that motivation to make accurate judgements facilitates reliance on those beliefs and inferential strategies which are considered most appropriate, whilst motivation to arrive at a particular desired conclusion facilitates reliance on those beliefs and inferential strategies which are considered most likely to yield the desired conclusion (Kunda, 1990). Individuals seem more likely to arrive at conclusions which they want to arrive at, but a given conclusion will only be endorsed if sufficient information in memory can be retrieved or constructed to support it (Kunda, 1990, 1999).

Future empirical work investigating optimistic bias for food hazards and nutrition-related health problems should seek to examine the extent and nature of any interplay between motivational and cognitive processes. Motivations to arrive at accurate or desired conclusions could be manipulated experimentally. The impact of different motivations on the types of memory search procedures employed when individuals make comparative risk judgements could then be specified (for a fuller review, see Kunda, 1990, 1999). Existing empirical work has helped generate a number of interventions directed at reducing optimistic bias and these are reviewed in the next section; but a fuller understanding of the interplay between motivational and cognitive factors may aid in the design of future, possibly more efficacious, interventions.

## Reducing optimistic bias

Empirical interest in eliminating optimistic bias is based on the idea that reducing optimistic bias will encourage health-protective behaviour and, by implication, reduce illness or injury (Weinstein & Lyon, 1999). Most models of health-protective behaviour, such as the Protection Motivation Theory (Rogers, 1975), the Health Belief Model (Janz & Becker, 1984), and the Precaution Adoption Process (Weinstein, 1988), include the individual's perception of vulnerability to a hazard as one of the preconditions for adopting behaviours that reduce risk (Cummings *et al.* 1980; Janz & Becker, 1984; Weinstein, 1993). Furthermore, there is evidence that optimistic bias does reduce individuals' motivation to take precautions (Weinstein, 1982; Burger & Burns, 1988; Davidson & Prkachin, 1997; Rothman *et al.* 1999; Weinstein & Lyon, 1999).

Previous empirical attempts to reduce optimistic bias have led to varied results. Some methods have been successful at reducing optimistic bias: for example, providing variable base rates (Chandler *et al.* 1999); increasing respondents' accountability for their judgements, by informing them that they would be taken out and tested on rated aspects of their driving, such as judging stopping distances (McKenna & Myers, 1997, study 2); reducing perceived social distance between the self and the comparison target by making the self and the target seem more similar (Harris *et al.* 2000). As described earlier (p. 13), there is also evidence that optimistic bias can be reduced by changing the comparison target, for example less optimistic bias has been found when individuals compare their risk with that of friends and family members (for example, Perloff & Fetzer, 1986). Comparison with targets that individuals have had personal contact with has also been seen to reduce optimistic bias, as does comparison with individuated others (for example, a specific classmate), as opposed to non-individuated others (for example, the average student) (Alicke *et al.* 1995).

Attempts to reduce optimistic bias by dealing with egocentrism have indicated that making individuals aware of risk factors that increase or decrease their chances of experiencing negative life events before rating their own chances of experiencing these events will reduce optimistic bias, although not eliminate it (Weinstein, 1980, (study 2), 1983; Weinstein & Lachendro, 1982) It was argued that reviewing information about others' risk factors reduced the respondents' egocentrism, by making them aware of the type of factors that other individuals have in their favour, or against them. In addition, Weinstein & Lachendro (1982) found that asking individuals to take the perspective of the comparison target to generate risk factors before rating comparative risk reduced optimistic bias. However, there is other evidence that supplying respondents with information about risk factors, without providing them with any information about other individuals' standing on these factors, will actually increase optimistic bias (Weinstein, 1983; Weinstein & Klein, 1995, study 2). Merely pointing out risk factors can provide new opportunities for biased interpretation and increases in optimistic bias.

In an attempt to reduce optimistic bias associated specifically with food hazards, Miles (2001) provided information designed to counter two possible causes of optimistic bias. The information encouraged respondents not to compare themselves with an inappropriate, stereotyped, comparison standard, nor to view risk-increasing and -decreasing factors in an egocentric manner. The results indicated that the information manipulation reduced optimistic bias for Salmonella and genetic modification, but there was no effect for BSE.

## *The benefits of optimistic bias*

There is increasing evidence that there can be benefits to having optimistic (or positive) expectations, including exhibiting optimistic bias about the likelihood of experiencing future events (Taylor & Brown, 1988, 1994; Armor & Taylor, 1998). In a review of the literature, Armor & Taylor (1998) describe a number of studies where optimistic expectations in individuals encountering life-threatening events were associated with positive attitudes, positive mood, an elevated sense of control, increased attention to risk information and engagement in more health-promoting behaviour. For example, Leedham *et al.* (1995) found that positive expectations about future health in cardiac patients awaiting heart transplants was associated with psychological wellbeing, adherence to medical regimens and good physical health after transplantation. Taylor *et al.* (1992) found that HIV-seropositive gay men were optimistic about the likelihood of developing AIDS. However, contrary to suggestions that such optimism may undermine self-protective behaviour, they engaged in both general self-protective health behaviours and low-risk sexual activity.

There is further evidence of the beneficial effects of optimism about the future for physical health, for example Reed *et al.* (1994) found that optimism about future health in gay men with AIDS was associated with a longer survival time than a realistic acceptance. Furthermore, Segerstrom *et al.* (1998) found that optimism about their risk of failure in first year law students was associated with better psychological and physical (beneficial immune system changes) adjustments to stressful events. Contrary to the argument that optimistic bias may lead to individuals ignoring potential health threats, and inattention to health-risk messages, Aspinwall & Brunhart (1996) found that

optimistic beliefs about personal health were related to increased attention to health-risk information, and greater recall of that information.

This evidence suggests that optimistic bias may not always lead to risky behaviour or inattention to risk messages. However, the studies reported here consider individuals currently experiencing some stressful or life-threatening event. It may be that a situation where individuals are optimistically biased about the likelihood of experiencing health hazards such as CHD, or food poisoning at some time in the future will result in a different pattern of responses. Under such conditions, individuals may take precautions (for example, not eating runny eggs, avoiding cross-contamination or thoroughly cooking meat every time they prepare food to protect against food poisoning), or they may not. Further work is required to elucidate the conditions under which optimistic bias leads to beneficial effects, and those under which it results in negative effects.

## Discussion

While empirical work reviewed in the present paper indicates that, on a general level, optimistic bias operates in the food domain, future research should examine the extent to which the bias operates for different specific hazards within this general domain. Greater specification of the precise food- or nutrition-related hazards for which optimistic bias does or does not operate should aid the design of future health-promotion initiatives seeking to encourage performance of health-protective behaviour on the part of individuals. Organisations responsible for crisis management of food-scare situations should also benefit from such investigations.

Additionally, there is a pressing need to establish whether or not self-favouring biases, including optimistic bias, for positive and negative events are independent phenomena with different underlying causes and different interventive implications. Future research might also usefully investigate the nature of the psychological processes that may link individuals' self-favourable judgements about their risk-relevant behaviour with their perceived comparative invulnerability to negative events with which that behaviour is associated.

Researchers evaluating or conducting optimistic bias investigations need to consider carefully the aspects of methodology that may influence the degree of optimism obtained. In particular, there is a real need for future research to examine the impact of comparison standard and target specification upon levels of bias obtained within specific hazard domains. The nature of individuals' real-life comparative preferences should also be established. Taken as a whole, research reviewed in the present paper suggests that a fuller understanding of the causes of optimistic bias, and of the different conditions under which it operates, will both assist in predicting the likelihood of its occurrence in food- and nutrition-related domains, and inform the design of interventions attempting to counter it.

Here we list a number of issues that health promoters and risk communicators working in the food area should consider when providing the public with information about food-related hazards:

(1) Many food-related hazards are associated with optimistic bias, such as heart attacks and heart disease, weight gain and obesity, other health effects related to consumption of a high-fat diet, drinking problems and other associated health effects (for example, liver disease and liver cirrhosis), gallstones, diabetes, and food poisoning. Health promoters and risk communicators need to be aware that the individuals with whom they are communicating, regarding these food-related hazards, may believe that they are less at risk than other individuals and so not attend to the information.

(2) Individuals also show biases that favour themselves for behavioural risk factors associated with these hazards. Health-promotion campaigns need to make individuals more aware of their standing on these risk factors, through, for example, providing information about individuals' actual dietary or other lifestyle behaviour.

(3) Optimistic bias has also been associated with controllable hazards. Individuals feel that they can control both their exposure to hazards and the risk factors associated with such hazards. Through egocentric thinking, individuals may believe that they take more actions to protect themselves than other individuals, or that the actions they take to protect themselves are more appropriate or successful than those taken by other individuals. Information needs to make it clear what precautionary behaviour other individuals are taking and the positive impact on health that such behaviour has.

(4) Optimistic bias is linked with the belief that lack of experience with a hazard in the past is protective against experience in the future. In situations where this is not appropriate, information needs to make this clear.

(5) Health-promotion campaigns should avoid creating a stereotypical 'at risk person', as individuals may compare themselves with these stereotypes and incorrectly assume that the advice is not appropriate for them.

(6) Health-promotion campaigns should also avoid referring to general, non-individuated individuals. Messages describing, for example, individuals at risk should refer to specific, concrete individuals.

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