Psicothema 2005. Vol. 17, nº 2, pp. 325-331
www.psicothema.com

ISSN 0214 - 9915 CODEN PSOTEG

A meta-analytic review of framming effect: risky, attribute and goal framing

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This work reports the results of a meta-analytic study about framing effect. An exhaustive literature search identified 51 independent primary studies, published between 1997 and 2003, that fulfilled the selection criteria. The studies produced 151 estimations of the effect size with nearly 13,500 subjects. The effect, measured as *d* index, was 0.437 for risky frame, 0.260 for attribute frame, and 0.444 for goal frame. The influence of other moderating variables was also analysed, such as gender of participants, design, or response mode. Finally, alternative explanations of the findings and implications are discussed.

Una revisión meta-analítica del efecto del marco: marco de riesgo, atributo y objetivo. En este trabajo se presentan los resultados de un estudio meta-analítico sobre el efecto del marco. Una búsqueda exhaustiva de la literatura nos permitió identificar 51 estudios primarios independientes, publicados entre 1997 y 2003, que cumplían con los criterios de selección establecidos, y que dieron lugar a 151 estimaciones del tamaño del efecto con cerca de 13.500 sujetos. El efecto, mediante el índice *d*, fue de 0.437 en el caso del marco de riesgo, 0.260 en el marco de atributo y 0.444 en el marco de objetivo. Se analizó la influencia de diversas variables moderadoras, como el género de los participantes, el diseño, el modo de respuesta, etc. Finalmente, se discuten las posibles explicaciones de los resultados y sus implicaciones.

Research on judgment and decision making has identified important violations of rational choice theory (Mellers, Schwartz and Cooke, 1998). In the early 1980s, Tversky and Kahneman (1981) initiated framing effect research in psychology, and it has since gained great popularity and recognition (León and Botella, 2003). Applications can be found in diverse areas, such as consumer behavior, organization, health or politics (e.g. Druckman, 2001a; Krishnamurthy, Carter and Blair, 2001).

In view of the fact that the scientific literature defines the framing effect in an informal way, confusing the term with what we call the «risky framing effect», it would seem appropriate to state a formal definition of the phenomenon, before defining the three different frame types. We suggest the following: given a task expressed in certain terms T_+ (that is, set out in an F_+ frame), and given another task formally identical but semantically manipulated T_- (that is, set out in an F_- frame), *framing effect* is defined as the significant difference observed in subjects' responses to F_+ and F_-.

In our meta-analysis we will follow the taxonomy of Levin, Schneider and Gaeth (1998), distinguishing between risky, attribute and goal framing. This classification facilitates understanding of the framing phenomenon. What is the risky framing effect? Given a certain situation S_+ set out in positive terms (e.g., live, win, etc.), with n response options implying different final results with different uncertainty levels r_1, r_2, …, r_n, and given the same situation set out in negative terms (e.g., die, lose, etc.), denoted by S_-, with the same number of response options, n, and the same final results r_1, r_2, …, r_n, we define *risky framing effect* as the subjects' trend for choosing the lower uncertainty option at S_+, and the higher uncertainty option at S_-. In other words, it refers to the tendency to prefer the sure option in a positive frame and the risky option in a negative frame (Tversky and Kahneman, 1981). The prototypical task is their Asian disease problem: the majority of subjects who are given the positively-framed version problem (a sure saving of one-third of the lives versus a one-third chance of saving all the lives and a two-thirds chance of saving no lives) select the option with the certain outcome, whereas the majority of subjects who are given the negatively framed version (a sure loss of two-thirds the lives versus a one-third chance of losing no lives and a two-thirds chance of losing all the lives) select the risky option.

What is attribute framing effect? Given a certain attribute (object or event) A_+ set out in positive terms (e.g., success, lean, etc.) with n response options implying different degrees of attraction d_1, d_2, …, d_n, and given the same attribute set out in negative terms (e.g., failure, fat, etc.), denoted by A_-, with the same number of response options, n, and the same degrees of attraction d_1, d_2, …, d_n, we define attribute framing effect as the subjects' trend for evaluating A_+ with higher degrees of attraction level and A_- with lower degrees of attraction. In other words: it refers to subjects' inclination to make more positive evaluations of items framed positively (Levin *et al.*, 1998). By way of example, Levin and Gaeth (1988)

Fecha recepción: 30-4-04 • Fecha aceptación: 16-11-04
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found that ground beef is rated as more tasty when it is labelled in a positive valence (75% lean) than when it is labelled 25% fat.

The principal differences between risky framing and attribute framing are that the latter does not involve risk manipulation, and the task goal does not consist in choosing between two independent response options, but rather in evaluating the acceptance (either on a several-values scale or on an accept-refuse dichotomic scale) of a certain item (Levin *et al.*, 1998).

What is goal framing effect? Given a certain message M_+ set out from a positive frame (opportunity to make a gain or avoid a loss), and given the same message set out from a negative frame (opportunity to make no gain or suffer a loss), denoted by M_-, we define goal framing effect as the difference in persuasive impact between M_+ and M_- for achieving a certain behavior. Here, the question is which valence frame is more powerful for persuading the subjects (Levin et al., 1998). Levin *et al.* (1998) hold that in risky and attribute framing the *item* is defined from a positive or negative valence (e.g., live vs. die). However, in goal framing the item valence is considered –from the persuader's perspective– as always positive or negative (e.g., mammography screening). In this latter case, the *consequences* are described from a positive or negative valence (more possibilities of detecting a tumour vs. less possibilities of detecting a tumour).

Why do subjects prefer a certain option depending on the valence? The most important model is the prospective theory (risky frame focused), an alternative to classical utility theory for describing human choice behavior, that incorporates sensitivity to differences in magnitude rather than the absolute magnitude of stimuli. Prospect theory focuses on the difference between an asset position of an option and a reference point (Fagley and Miller, 1997). It postulates that valence manipulation (positive or negative) determines the way that presented information is perceived (gain or loss), which affects decision making (Tversky and Kahneman, 1981). In risky framing, subjects are risk-prone when options are evaluated in cost terms (subjective value is a convex function of utility), whereas they show conservative behavior, that is, risk-averse, when options are evaluated in benefit terms (subjective value is a concave function of utility). The S-shape value function predicts that an item will be perceived as more unpleasant from a negative valence than pleasant from a positive valence.

In his meta-analysis, Kühberger (1998) found that diverse operational, methodological and task-specific features made it impossible to speak of a single framing effect. As a consequence, his results were biased (Levin *et al.*, 1998). To solve this problem, we have proposed a formal definition for framing effect, and we have distinguished between risky, attribute and goal framing, following Levin *et al.* (1998) taxonomy. We used Kühberger's (1998) meta-analysis as a reference paper for the coding of the study characteristics, searching papers from 1997 since his data pool ended in 1996. We added 2 new variables: gender (variable which appears in literature with contradictory results) and study source. So, in this meta-analysis, our goals are: (1) To integrate risky, attribute and goal framing study results; and (2) To analyse the influence of diverse moderator variables in each type of framing.

Method

Database

To locate the relevant studies we carried out: a) Computer searches (Psycinfo, Medline, Business Source Premier, Regional Business News and Econlit) with the key terms *choice*, *decision making*, *framing*, *prospect theory*, *reflection*, *Tversky* and *Kahneman*; b) direct review of specialized journals and their references, and c) informal e-mail enquiry to the *Society for Judgment and Decision Making*.

To be included in the meta-analysis, studies needed to fulfil two criteria: (1) to deal with decision making in risky, attribute or goal framing; and (2) to be experimental articles with human adults between 1997 and 2003. Our search yielded 51 papers (151 effect sizes) that reported framing experiments with 13,343 participants.

Coding

Three higher order moderator variables were examined. *Methodological Variables* included: (a) participants (students, other); (b) gender (% of women in the sample); (c) experimental design (between-subjects, within-subjects); (d) unit of analysis (individual behavior, group behavior). *Context Variables* included: (a) year of publication; (b) study source (Psychology, Politics, Economics). *Task Variables* included: (a) frame type (risky, attribute, goal); (b) number of options (single risky option, multiple risky options for risky frame; single option, multiple options for attribute and goal framing); (c) framing manipulation (gain/loss terms, other terms); (d) response mode (choice, judgment); (e) domain (economic, social, health); (f) problem (Asian disease, gambling, tax, clinical reasoning, product, message, investment, evaluation of objects, social dilemma, other). For details, readers may e-mail the authors.

A reliability study for coding and *d* calculation was carried out, in which two other researchers codified independently a sample of the studies. The level of agreement reached was highly satisfactory. Inconsistencies were solved by consensus.

Data analysis

Calculations of effect size were based on the procedures proposed by Hedges and Olkin (1985) using Cohen's *d*, defined as the standarized mean difference. We used Lipsey and Wilson's (2001) Excel macro, which calculates *d* from a wide variety of inputs: means and SDs, proportions, frequencies, etc. In risky framing, the sign is positive when subjects are more risk-averse with gains and more risk-seeking with losses. In attribute framing, the sign is positive when subjects make better evaluations with positive valences. In goal framing, *d* is positive when different responses between frames occur, or zero if there are no differences. We used the pooled standard deviation both in between-subjects and within-subjects design.

After the description of study characteristics, a weighted mean effect was calculated for each class of frame. Next, we tested the homogeneity of the effect size and we analyzed the influence of moderator variables using a categorical model (ANOVA analogous) and weighted regression analysis (fixed-effects model) with the macros for SPSS 10.0 (Lipsey and Wilson, 2001).

Results

Description of studies

Moderator variables description is presented in Table 1. With regard to *methodological variables*, student samples (83.4%), be-

tween-subjects design (88.7%) and individual analyses (96.7%) dominate framing research. Most samples came from Psychology (53%) and Economics (33.8%).

The data for *task variables* indicate that most of the effect sizes were related to risky framing (57.6%), with similar proportions in attribute framing (19.9%) and goal framing (22.5%). Single option was prevalent (78.1%), as was gain/loss frame (94.7%). Choice response mode was used in 60.3% of cases. The most common domains were health (35.8%), economic (33.1%) and social (20.5%). As regards the problem, the Asian disease was the most common task (47.7%), ahead of evaluation of objects (16.6%) or messages (10.6%).

Finally, in relation to *context variables*, Psychology studies reported gender most frequently (59%), and used most women (2.3 women per man). Gender was not usually reported in Politics (68%) or Economics studies (65%), but proportion of men-women in their samples was similar. We found 51 articles, implying approximately 7 articles per year (SD= 2.14).

Table 1
Moderator variables description

Variables	Features	*k*	%
Methodological variables			
Participants	1. Students	126	83.4
	2. Target	21	13.9
	3. Mixed	4	2.6
Design	1. Between-sub	134	88.7
	2. Within-sub	17	11.3
Unit	1. Individual	146	96.7
	2. Group	5	3.3
Context variables			
Study Source	1. Psychology	80	53
	2. Politics	19	12.6
	3. Economics	51	33.8
	4. Other	1	0.7
Task variables			
Frame Type	1. Risk	87	57.6
	2. Attribute	30	19.9
	3. Goal	34	22.5
Options	1. Single	118	78.1
	2. Multiple	33	21.9
Manipulation	1. Gain/Loss	143	94.7
	2. Other	8	5.3
Response	1. Choice	91	60.3
	2. Judgment	60	39.7
Domain	1. Economic	50	33.1
	2. Social	31	20.5
	3. Health	54	35.8
	4. Other	16	10.6
Problem	1. Asian	72	47.7
	2. Gambling	7	4.6
	3. Tax	4	2.6
	4. Clinical	10	6.6
	5. Product	5	3.3
	6. Message	16	10.6
	7. Investment	3	2
	8. Evaluation	25	16.6
	9. Dilemma	4	2.6
	10. Other	5	3.3

k= number of effect sizes

Average effect sizes

Overall average effect sizes are presented in Table 2. We obtained from small to moderate effect sizes, with similar values for risky and goal framing (d= 0.44), whereas attribute framing had a value of d= 0.26. Variability of the effect sizes is significant (p<.0001), and the relevant test statistic shows clear heterogeneity of the effect sizes.

Potential moderator variables

The results for risky, attribute and goal framing are presented in Table 3. In risky framing, student samples with between-subjects design were frequent (d= 0.50). Although individual analysis was prevalent, data show a possible higher effect with group analysis (k= 4; d= 0.72). Effect sizes for Psychology and Economics studies were lower than those for Politics (d= 0.71). All tasks used gain/loss-wording, preferentially with single option (d= 0.45) and choice as response mode (d= 0.45). As regards problem domains, higher effects were found for mixed domains (d= 0.62). Tasks related to products appeared to be most effective (k= 4; d= 0.89), although the Asian disease problem was the most frequent (d= 0.43).

As for quantitative variables, a regression analysis showed significant associations, both for gender -% of women- ($Q_R(1)$= 11.923, p= 0; R^2= 0.191) and year of publication ($Q_R(1)$= 7.428, p= 0.006; R^2= 0.015). Effect size was higher with more women in the sample, and/or with recent studies. We selected a regression model with gender, year, source, design, unit of analysis, options, response mode and problem that obtained R^2= 0.290 (gender: β= 0.40, p= 0.025; options: β= -0.40, p= 0.046).

Table 2
Statistical summary of framing effect sizes (Cohen's d)

	Risk	Attribute	Goal
K	87	30	34
Mean *d* (unweighted)	.404	.395	.540
Mean *d* (weighted by reciprocal of variance)	.437	.260	.444
Proportion *d* < 0	.23	.27	0
Proportion *d* = 0	.01	.03	0
Proportion *d* > 0	.76	.70	1
95% CI	[.39,.48]	[.18,.34]	[.36,.53]
Significance test			
Combined Stouffer Z	19.63***	6.30***	10.56***
Variability			
Maximum *d*	1.52	2.03	1.53
Minimum *d*	-0.77	-0.60	0.05
S	0.494	0.553	0.294
SE	0.022	0.041	0.042
Q(DF)	492.52(86)***	180.03(29)***	48.79(33)*

***p<.0001 ; *p<.05

In attribute framing, student samples and between-subjects design were more common, but showed lower effect sizes (d= 0.22; d= 0.24). There was no group analysis or choice response mode in this frame type. Most of the studies came from Economics (d= 0.42), and, surprisingly Psychology studies appear to show ineffective results (d= -0.25). Multiple option (d= 0.37) was clearly more effective than single option (d= 0.19). Tasks were frequently expressed in gain/loss-wording (d= 0.25). Economic and social domains were prevalent (d= 0.34; d= 0.35), evaluation of objects being the prototypical task in this frame (d= 0.21).

Neither gender ($Q_R(1)$= 0.953; p= 0.329; R^2= 0.018) nor year ($Q_R(1)$= 3.674; p= 0.055; R^2= 0.020) were significant. A selected regression model of 7 variables was found (study source, number of options, participants, gender, year, framing manipulation and problem) with R^2= 0.465 (gender: β= 1.09, p= 0.001; year: β= 0.91, p= 0.003; framing manipulation: β= 0.68, p= 0.049; problem: β= 0.85, p< 0.001).

Finally, none of the variables, except options number, had a significant homogeneity test (p>.05) in goal framing. In contrast to previous frames, in this case 50% used target or mixed samples,

Table 3
Risky, attribute and goal framing weighted ANOVA

	Risky Framing				Attribute Framing				Goal Framing			
Characteristic	***k***	***d***	**95% CI**	**Q_w**	***k***	***d***	**95% CI**	**Q_w**	***k***	***d***	**95% CI**	**Q_w**
Participants		$Q_B(1)$ = 2.64				$Q_B(1)$ = 4.12*				$Q_B(2)$ = 1.08		
Students	85	.44	[.40, .49]	478.99***	24	.22	[.13, .31]	169.33***	17	.42	[.31, .53]	13.98
Other	2	.21	[-.07, .49]	10.90***	6	.45	[.25, .64]	6.57	13	.50	[.36, .63]	32.36**
Mixed	–	–	–	–	–	–	–	–	4	.36	[.04, .67]	1.37
Exp. Design		$Q_B(1)$ = 31.61***				$Q_B(1)$ = 2.57						
Between	72	.50	[.45, .55]	316.04***	28	.24	[.16, .33]	177.40***	34			
Within	15	.18	[.08, .28]	144.87***	2	.51	[.19, .83]	0.05	0			
Analysis Unit		$Q_B(1)$ = 11.64***								$Q_B(1)$ = 0		
Individual	83	.42	[.37, .46]	468.91***	30				33	.44	[.36, .53]	48.79*
Group	4	.72	[.55, .89]	11.97**	0				1	.45	[.05, .85]	0
Study Source		$Q_B(2)$ = 18.09***				$Q_B(2)$ = 42.45***				$Q_B(3)$ = 1.80		
Psychology	56	.38	[.33, .44]	378.69***	4	-.25	[-.42, -.08]	31.74***	20	.45	[.32, .58]	13.24
Politics	12	.71	[.57, .84]	18.26	4	.29	[.10, .49]	6.65	3	.34	[.11, .57]	4.77
Economics	19	.46	[.38, .55]	77.47***	22	.42	[.32, .53]	99.19***	10	.45	[.32, .58]	28.98***
Other									1	.63	[.26, 1.0]	0
Options		$Q_B(1)$ = 6.94**				$Q_B(1)$ = 4.60*				$Q_B(1)$ = 7.49**		
Single	79	.45	[.40, .49]	474.15***	20	.19	[.08, .29]	141.95***	19	.36	[.26, .46]	12.22
Multiple	8	.14	[-.09, .36]	11.43	10	.37	[.24, .50]	33.48***	15	.60	[.46, .75]	29.08*
Manipulation						$Q_B(1)$ = 1.01				$Q_B(1)$ = 0.20		
Gain/Loss	87				27	.25	[.17, .33]	166.78***	29	.45	[.36, .54]	47.09*
Other	0				3	.51	[.02, 1.0]	12.23**	5	.39	[.14, .64]	1.50
Response		$Q_B(1)$ = 3.49								$Q_B(1)$ = 1.64		
Choice	79	.45	[.40, .49]	461.73***					12	.35	[.19, .52]	7.87
Judgment	8	.27	[.08, .45]	27.31***					22	.48	[.38, .57]	39.28**
Domain		$Q_B(4)$ = 41.18***				$Q_B(3)$ = 17.82***				$Q_B(2)$ = 1.30		
Economic	32	.41	[.34, .49]	208.44***	11	.34	[.21, .47]	41.16***	7	.49	[.32, .65]	22.08**
Social	6	-.03	[-.20, .15]	2.54	13	.35	[.21, .49]	47.75***	12	.36	[.18, .53]	3.04
Health	36	.45	[.38, .52]	212.66***	3	.24	[.05, .43]	59.84***	15	.46	[.35, .58]	22.37
Mixed	13	.62	[.52, .73]	27.70**	3	-.19	[-.41, .04]	13.45**	–	–	–	–
Problem		$Q_B(3)$ = 35.22***				$Q_B(4)$ = 31.08***				$Q_B(4)$ = 3.60		
Asian	72	.43	[.38, .47]	430.35**	–	–	–	–	–	–	–	–
Gambling	7	.18	[-.05, .40]	10.46	–	–	–	–	–	–	–	–
Product	4	.89	[.71, 1.0]	3.37	1	.46	[-.08, 1.0]	0	–	–	–	–
Tax	–	–	–	–	–	–	–	–	4	.38	[.20, .57]	13.05**
Clinical	–	–	–	–	2	.90	[.64, 1.2]	2.23	8	.42	[.30, .55]	14.04
Message	–	–	–	–	–	–	–	–	16	.52	[.32, .72]	11.36
Investment	–	–	–	–	1	0	[-.23, .23]	0	2	.67	[.37, .97]	5.47*
Dilemma	–	–	–	–	–	–	–	–	4	.38	[.15, .61]	1.28
Evaluation	–	–	–	–	25	.21	[.11, .30]	146.72	–	–	–	–
Other	4	.21	[.01, .42]	13.11**	1	.65	[-.36, 1.7]	0	–	–	–	–

***p<.001; ** p<.01; *p<.05

with similar results ($Q_B(2)$= 1.08, p>.05). All experimental designs were between-subjects, and nearly all performed individual analysis (d= 0.44). Psychology and Economics studies were the most common (d= 0.45). Multiple option was clearly more effective (d= 0.60). As in the case of attribute frame, gain/loss-wording (d= 0.45) and judgment response mode (d= 0.48) were prevalent. Health and social domains were the most common (k= 15; k= 12), with message (d= 0.52) and clinical reasoning (d= 0.42) the frequent tasks.

Gender ($Q_R(1)$= 0.657; p= 0.418; R^2= 0.020) and year ($Q_R(1)$= 0.507; p= 0.477, R^2= 0.010) were not statistically significant. A selected regression model of 8 variables (options, framing manipulation, mode, problem, study source, participants, gender and year) showed a goodness of fit of R^2= 0.569 (options: β= 1.47, p< 0.001; year: β= 1.07, p= 0.014; source: β= -0.94, p= 0.010; problem: β= -0.76, p= 0.018).

Questions of validity

Taking into account the fact that our meta-analysis included only two unpublished articles, the results reported here may be biased (Rosenthal, 1979). Therefore, we calculated the number of unpublished studies we should consider in order to change our findings. The result ($1 - \alpha$= 0.95) was 12,377 studies for risky framing, 413 studies for attribute framing and 1,376 studies for goal framing. All cases fulfil $N_s > 5k + 10$, so that we believe our meta-analysis to be safe from this validity threat (Rosenthal, 1991).

As regards within-study independence (Rosenthal and Rubin, 1986), we used more than a single effect size in several studies, when each effect size implied different subjects and different experimental conditions We therefore do not think this threat poses a real risk to the meta-analysis.

Discussion

In risky framing effect (d= 0.437), the most important characteristics were gender and number of options. Effect size was greater with samples including women and a single risky option. The most frequent task was the Asian disease problem. Researchers most frequently used student samples, with individual data between-subjects design, and tasks in gain/loss terms with choice response mode. All of these characteristics showed large effect sizes (except for individual vs. group analysis).

The regression model only obtained R^2= 0.290, so that it is necessary to investigate new possible moderator variables in order to explain this complex phenomenon. We think uncertainty level of options may be one of these. The different semantic combinations discussed in Levin *et al.* (1998) may also be important. Given the importance of gender in this frame type, we believe that part of the variance may be explained by other subjects variables, such as neuroticism or self-esteem (more neuroticism or less self-esteem could imply more risk aversion).

The attribute framing effect had the smallest size (d= 0.260), and the prototypical task was evaluation of objects. Here, gender, year and problem explained most of the variance. The data show a surprising finding: except for response mode (all research carried out in this frame was with judgment response mode), researchers preferred the same characteristics as risky framing, but all of them showed lower effect sizes (student samples, between-subjects design, individual unit of analysis, single option and gain/loss terms). It is empirically clear that attribute framing is a different type of framing effect, and should be studied with different methodological options. Most probably, future research will obtain higher d values when analyzing attribute frame with multiple options tasks in target samples.

The goal framing effect size is d= 0.444. Message and clinical reasoning were the most common tasks, while number of options was the most important variable. The data show another surprising finding: the test of homogeneity did not find significant inter-characteristics differences for other variables. This does not, of course, mean that the variables chosen are not important. In fact, the regression model with 8 variables (options, framing manipulation, response mode, problem, study source, participants, gender and year) showed a medium goodness of fit (R^2= 0.569).

In goal framing effect, single vs. multiple option was the most important. Why was this? Our view is that the information processing for multiple options produces higher cognitive overload than the information processing for single options. In order to reduce cognitive overload, subjects simplify the decision process using heuristics (Kahneman, Slovic and Tversky, 1988; Gambara, 1990), and this explains a higher persuasive impact of message.

Behind the apparent conceptual similarities, data from risky, attribute and goal framing offer completely different results. The taxonomy has proved to be useful for examining the literature on the framing effect. There is now a need for more theoretical and empirical papers to explain the heterogeneity found and the different processes underlying the three framing types.

Finally, we believe there is a need to explore the framing effect using within-subjects design, not only since it is uncommon in the literature, but also because of its usefulness for analyzing whether a subject is «incoherent» (valence frame manipulation elicits different responses) or not. Differences between «coherent» and «incoherent» subjects could prove fundamental to a better explanation of the framing effect.

Acknowledgments

We acknowledge the collaboration of Jesus Garrido and Graciela Ponte in the coding reliability study, Dr. Botella and an anonymous reviewer for the comments on an earlier version of this paper.

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