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# Meta-Analysis of Consumers' Willingness to Pay for Sustainable Food Products

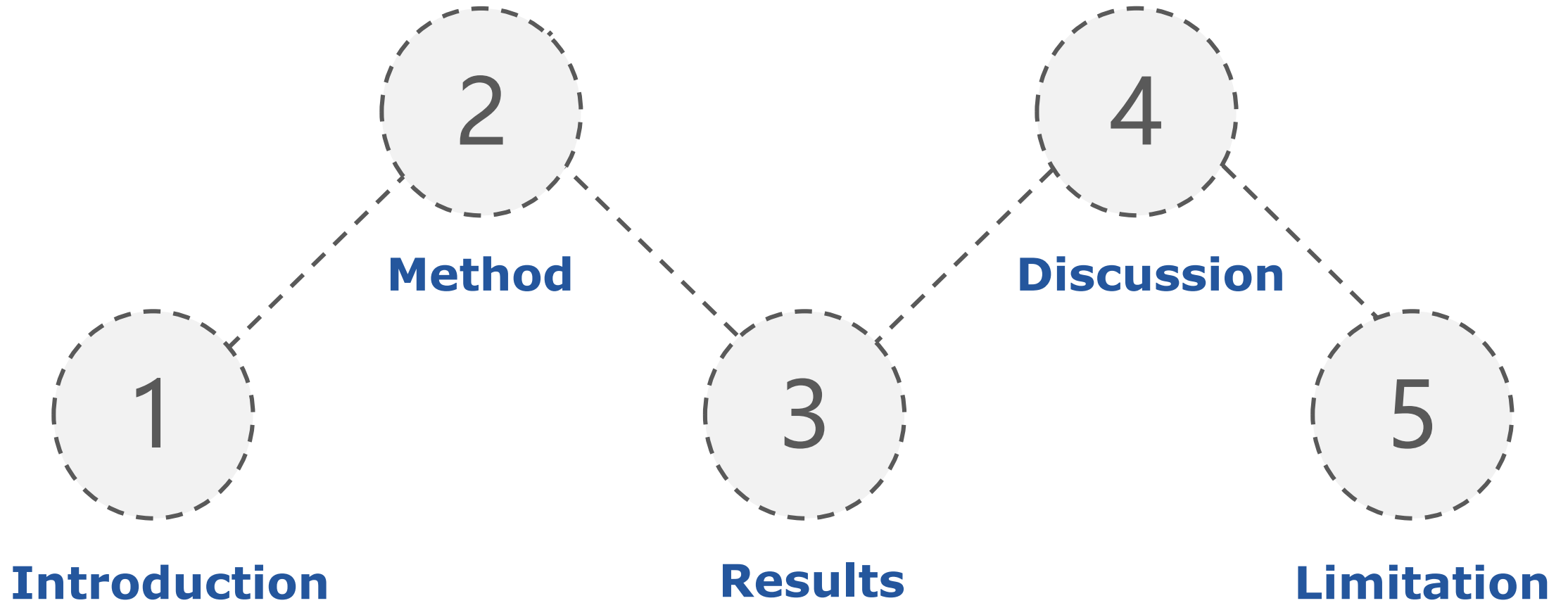


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# Outline

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# Introduction

- **Purchasing sustainable food:** a good way to **decrease the damage** of food to the environment
- Consumers increasingly paid attention to the **wider ethical issues and sustainable food products**
- Measuring **willingness to pay (WTP)** can understand consumers' attitudes and opinions towards sustainable attributes in food products
- Many studies attempted to investigate consumers' **WTP for sustainable food products**
- However, integrating different studies adopting meta-analysis for consumers' WTP towards sustainable food products **from a wider range** has **not** been conducted

## Overview of sustainable food products



**sustainable agriculture: a healthy environment, economic profitability, and social & economic equity**



**local, workers' welfare, animal welfare, fair-trade products, and carbon footprints products**



**willing to pay for sustainable food products**



**different influence factors, especially the socio-demographic characteristics for sustainable products**

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# Data and method

## 2.1 Strategy of literature search

- ◆ The available studies (from 2000 to 2020) were identified from Google Scholar and the Web of Science.
- ◆ Other databases were excluded due to few related articles.
- ◆ Keywords “consumer preferences”, “willingness to pay (WTP)”, “consumer behavior”, and “sustainable food products”.
- ◆ In order to reduce publication bias, we searched “grey” literature (e.g., conference abstracts) by scanning some researchers’ and institution websites.



80 papers were included based on three criteria:

(1) the topic was consumers' WTP for sustainable food products or sustainable attributes.

(2) the study reported the average consumers' WTP value for sustainable food, whether it was in monetary form or percentage form.

(3) studies using stated-preferences methods and revealed-preferences were included.

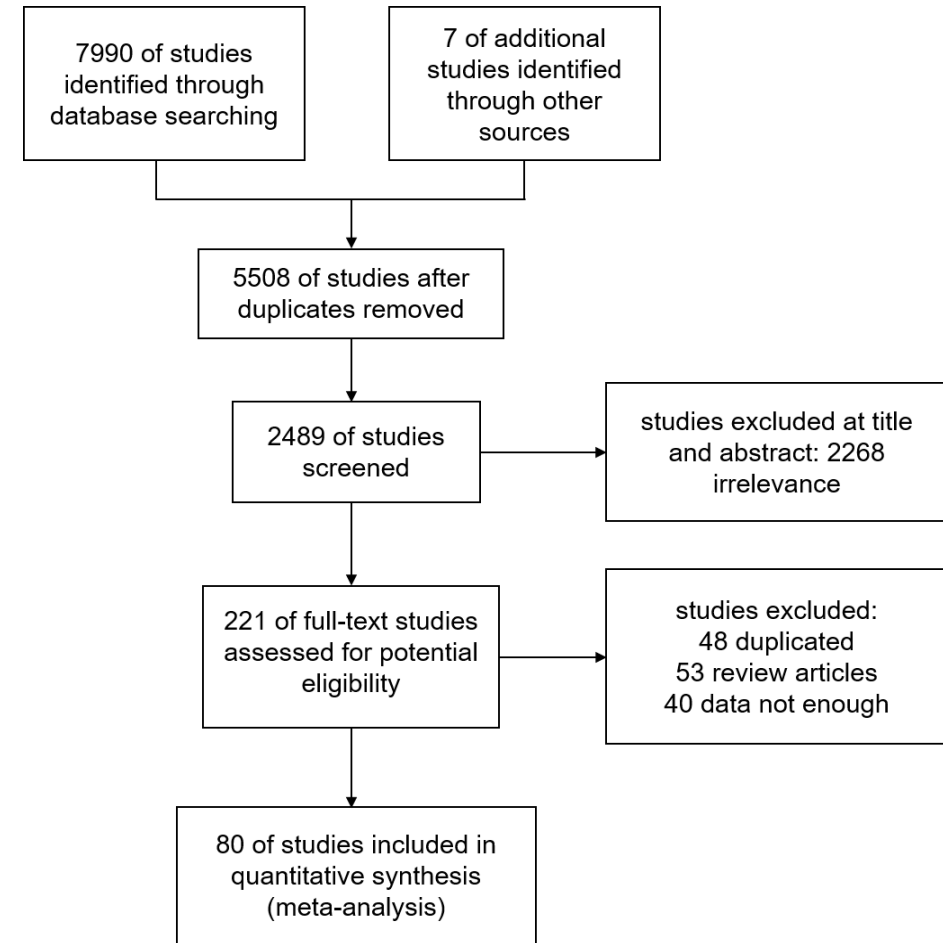


Fig.1 The flow diagram of the search and selection process

## 2.2 Data extraction and critical analysis Information

- Standardized average WTP value in included studies was taken as effect size. This was in agreement with the study of Xia and Zeng (2008).
- In order to tackle the currency difference issues and different WTP formats (i.e., the weight unit, product unit, and category), all WTP estimates were presented in percentage form.
- The WTP value was the price premium which meant the percent payment increased over conventional food price (Lagerkvist & Hess, 2011). Therefore, all WTP values in the 80 included papers were presented in the percentage form. For the monetary WTP, the transformation was as follows:
- $$WTP (\%) = \frac{WTP_{sustainable} - P_{conventional}}{P_{conventional}} \times 100\%$$





## 2.2 Data extraction and critical analysis Information

- The Egger's test was conducted to measure the publication bias.
- Subgroup analysis was adopted to test the deeper heterogeneity of the data.
- Finally, the meta-regression was used.



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# Results

**3.1 Descriptive statistics and Subgroup results**

**3.2 Meta-regression results**

### 3.1 Descriptive statistics and Subgroup results

**Table 1** Result of Egger's test (N = 80)

Std_Eff	Coef.	Std. Err.	t	P> t	Lower 95% CI	Upper 95% CI
<b>slope</b>	0.03	0.04	0.87	0.39	-0.04	0.11
<b>Bias</b>	13.12	2.64	4.96	0.00***	7.82	18.38

Note: \*\*\* Significance level: 0.01.  $P = 0.00 < 0.01$ , denoting that there is a significant difference, which means significant existence of publication bias.

### 3.1 Descriptive statistics and Subgroup results

**Table 2** Summary of the results from subgroup analysis

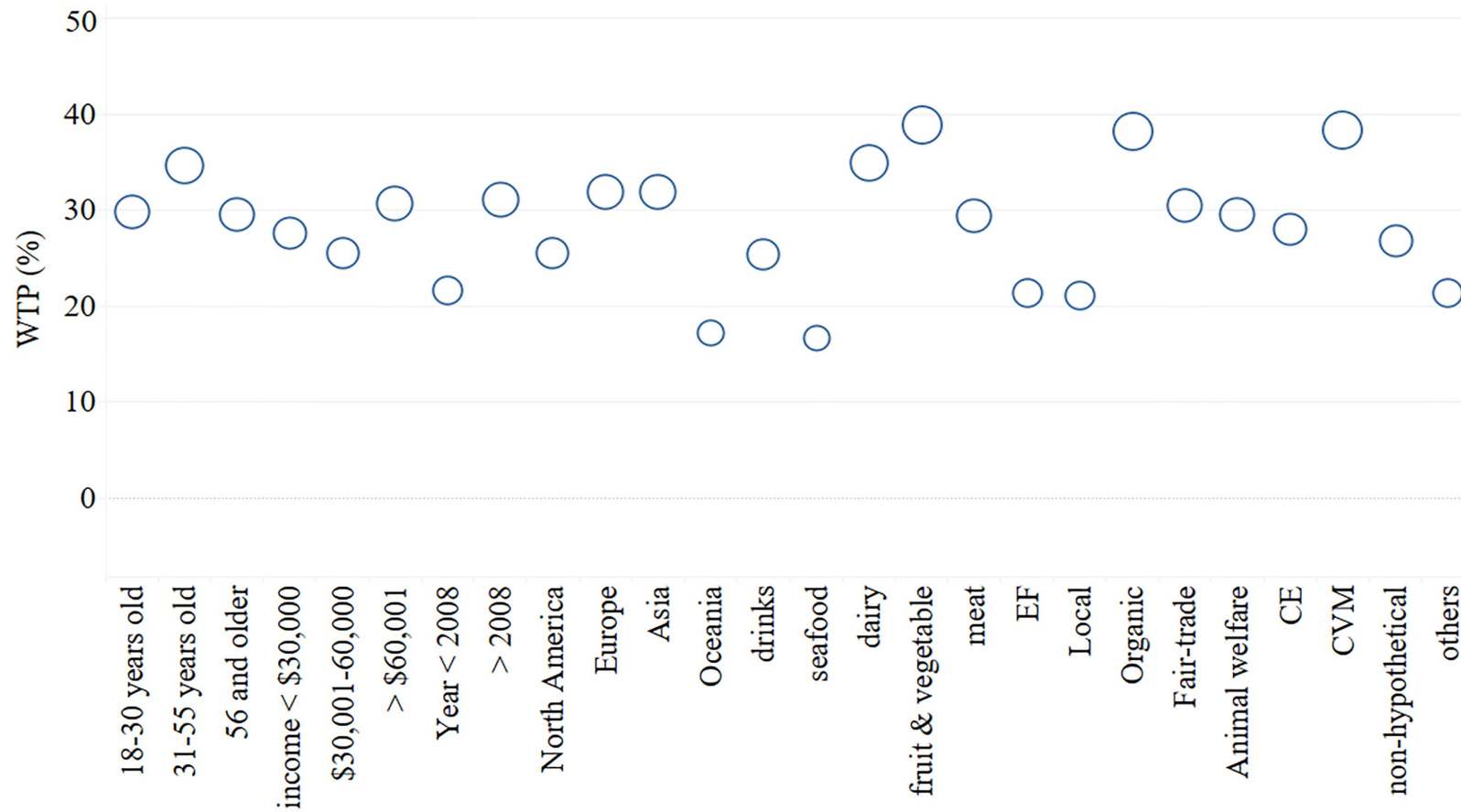
Subgroup	WTP Estimate	Lower 95% CI	Upper 95% CI	Study Numbers	p-value	I <sup>2</sup>	
18-30 years old	29.8%	25.0%	34.6%	7	0.015	99.7%	Subgroup of age (excluding outlier)
31-55 years old	34.6%	6.7%	62.5%	61	0.000	99.4%	
56 and older	29.5%	25.1%	33.8%	2			
< \$30,000	27.5%	15.9%	39.0%	25	0.301	90.6%	Subgroup of annual income
\$30,001-60,000	25.5%	16.8%	34.1%	18	0.000	99.2%	
> \$60,001	30.7%	20.6%	40.9%	6	0.047	98.1%	
year < 2008	21.6%	13.7%	29.6%	13	0.000	99.2%	Subgroup of date of publication
> 2008	31.0%	25.9%	36.0%	67	0.000	99.5%	
North America	25.5%	17.5%	33.5%	21	0.010	99.5%	Subgroup of region
Europe	31.9%	25.6%	38.2%	34	0.000	99.3%	
Asia	31.8%	20.6%	43.1%	21	0.020	99.7%	
Oceania	17.2%	4.9%	29.5%	4	0.006	98.0%	
drinks	25.3%	18.3%	32.2%	19	0.000	99.2%	Subgroup of food categories
seafood	16.6%	11.1%	22.1%	10	0.023	82.3%	
dairy	34.9%	14.5%	55.3%	8	0.001	99.2%	
fruit & vegetable	38.8%	26.6%	51.1%	20	0.062	99.6%	
meat	29.4%	19.8%	39.1%	15	0.000	99.3%	

### 3.1 Descriptive statistics and Subgroup results

**Table 2** Summary of the results from subgroup analysis

EF	21.3%	16.5%	26.1%	25	0.030	98.9%	Subgroup	of
local	21.1%	12.2%	30.0%	11	0.000	98.2%	sustainable	
organic	38.1%	28.2%	48.0%	29	0.028	99.6%	attributes	
fair-trade	30.5%	16.4%	44.6%	9	0.006	99.6%		
animal welfare	29.5%	25.2%	33.9%	6	0.104	98.9%		
CE	27.9%	20.7%	35.1%	27	0.001	99.5%	Subgroup	of
CVM	38.3%	28.4%	48.1%	25	0.009	99.7%	methods types	
non-hypothetical	26.7%	16.5%	37.0%	9	0.001	94.9%		
others	21.3%	14.7%	28.0%	19	0.000	98.9%		
Overall	29.5%	25.1%	33.8%	80	0.000	99.5%	Overall estimate	

Note: WTP estimates indicate the premium in percentages that consumers were willing to pay for sustainable food products.  $I^2$  means the variation in ES (effect size) attributable to heterogeneity, and all values are more than 80.0%, indicating the existence of high heterogeneity. EF: environmentally friendly. The subgroup analysis is conducted in Stata.



**Fig. 1** Results of subgroup analysis

Note: The y-axis represents the size of WTP estimates, and the x-axis shows each subgroup. The size of the circle indicates the size of the WTP value of each variable. Income means the annual household income. EF: environmentally friendly.

## 3.2 Meta-regression results

**Table 3** Results of the Meta-Regression

	Coef.	Std. Err.	P> t	Monte Carlo permutation test	
				Unadjusted p-value	Adjusted p-value
female	0.467**	0.226	0.044**	0.045	0.048**
university	-0.100	0.212	0.652	0.662	0.744
year < 2008	-0.002	0.145	0.991	0.991	0.998
< \$30,000	-0.082	0.160	0.617	0.701	0.756
\$30,001-60,000	0.008	0.129	0.954	0.954	0.988
hypothetical	-0.029	0.092	0.757	0.768	0.798
dairy	0.183*	0.108	0.095*	0.095	0.098*
drinks	-0.618**	0.062	0.012**	0.012	0.014**
fruit & vegetable	0.222**	0.088	0.014**	0.016	0.018**
meat	0.128	0.093	0.171	0.244	0.262
North America	0.614**	0.326	0.034**	0.034	0.038**
Asia	0.571**	0.257	0.022**	0.032	0.042**
Europe	0.644**	0.259	0.044**	0.044	0.048**
EF	-0.314**	0.122	0.017**	0.025	0.034**
local	-0.312*	0.156	0.058*	0.058	0.076*
organic	-0.137	0.135	0.322	0.322	0.412
animal welfare	-0.150	0.150	0.329	0.436	0.488
_cons	0.221	0.366	0.570		
Number of obs	80				

## 3.2 Meta-regression results



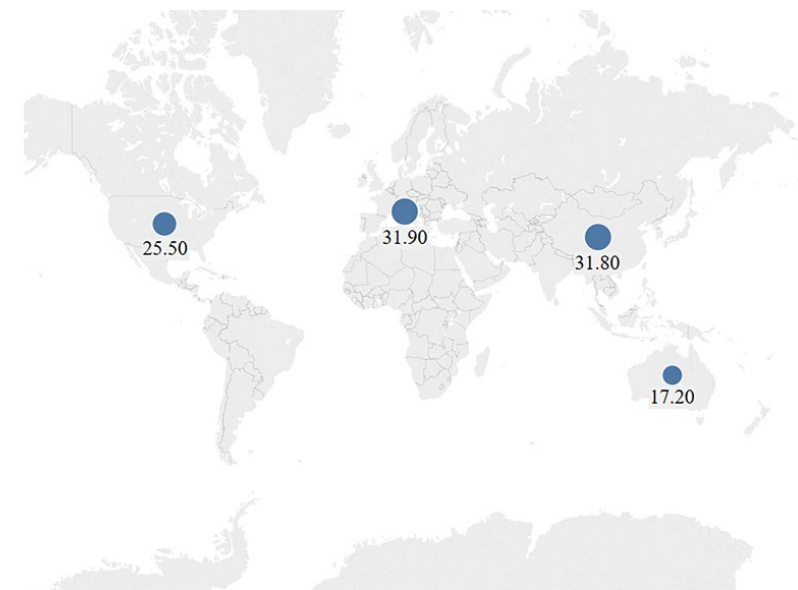
- The percentage of female, region, sustainable attributes, and food categories significantly influenced WTP estimates across studies.
- Regarding food categories, the results demonstrated that for drinks products ( $\beta = -0.618$ ), WTP estimates were significantly lower than dairy and fruit & vegetable products.
- The environmentally friendly attribute ( $\beta = -0.314$ ) reported statistically significant lower WTP values.



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# Discussion and conclusion

- The WTP value of the studies adopting hypothetical approaches is higher than non-hypothetical methods.
- The younger has a higher WTP value, while the 56 and older has the lowest WTP. It is consistent with some studies, which indicated that organic consumers were likely to be younger (Krystallis et al., 2006; Van Loo et al., 2013).
- WTP for organic food is higher than local food.
- Asian WTP estimates, in percentage terms, are higher than those obtained in North America and similar to those from Europe.
- The overall WTP is 29.5%. It is in accordance with the value of the current price premiums for organic attribute in the world, which is approximately between 20-40% (Xia & Zeng, 2008).



**Fig. 2** Results of region

## Practical implications



This study has many practical implications, for example, the organic attribute is preferred than the local one. Thus, retailers can use, and are using, this argument to first place and highlight organic items in hotlines on the shelves, specifically the fruit & vegetables category.

The WTP estimate for local food is the lowest. Hence, it is necessary to increase consumers' knowledge about local food products and consider how to differentiate them in the market.



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## Limitation

The results explain some of the heterogeneity and maybe there are other factors influencing heterogeneity that have not been considered, measured or studied.

## Reference:

- Krystallis, A., Fotopoulos, C., & Zotos, Y. (2006). Organic Consumers' Profile and Their Willingness to Pay (WTP) for Selected Organic Food Products in Greece. *Journal of International Consumer Marketing*, 19(1), 37–41. <https://doi.org/10.1300/J046v19n01>
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Thank you!

