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# **Participation Equality: Measurement Within Collaborative Electronic Environments- A Three Country Study**

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# **Participation Equality: Measurement Within Collaborative Electronic Environments- A Three-Country Study**

## *Abstract*

*While the engendering of participation equality is generally viewed as a desirable group process attribute, findings from prior empirical research are both inconsistent and inconclusive regarding the measurement of participation equality within collaborative electronically supported environments. One explanation for this inconsistency lies in the manner in which the “participation equality” construct has been studied and measured. Results of analyses performed across three distinct national cultures utilizing 86 experimental groups and over 660 participants from the United States, Hong Kong and Spain are presented with recommendations for future research involving the participation equality construct. This is a first paper in a series of working papers that study the effect of information technology, particularly computer mediated communication (CMC) technology, across various cultural and experimental settings*

## **Participation Equality: Measurement Within Collaborative Electronic Environments- A Three-Country Study**

Both scholars and practitioners interested in better understanding and supporting group decision activities have long recognized the benefits of facilitating collaboration and participation among a group's members. Some researchers have suggested that higher levels of interaction by a group's members will increase equal involvement by members (i.e. participation equality) leading to both an improved decision making process and greater member satisfaction with the group-related experience (Burke and Chidambaram, 1995; Locke, Alavi and Wagner, 1997).

The engendering of participation equality is often considered a desirable group process characteristic by both researchers (DeSanctis and Gallupe, 1987; Benbasat and Lim, 1993; Valacich, Dennis and Connolly, 1994; Kahai, Avolio and Sosik, 1998) and practitioners interested in facilitating participant interaction, particularly within electronically supported group decision making environments (Niederman, Beise and Beranek, 1996). In fact, a considerable amount of the effort to support effective IT-enabled environments for group decision making has focused on mechanisms intended to reduce the process losses associated with participation inequality, e.g., domination, evaluation apprehension and production blocking (George, Easton, Nunamaker and Northcraft, 1990; Nunamaker, Dennis, Valacich, Vogel and George, 1991; Valacich, et al., 1994; Lim and Benbasat, 1996).

However, an examination of the empirical research findings studies examining the influence of participation equality on electronically supported group decision making (see Table 1) suggests that the effects of participation equality may be neither large nor

consistent. And there may be numerous explanations as to why such mixed effects might be observed.

First and foremost, problems may exist as to how the participation equality construct has been empirically operationalized and measured. Previous research studies have frequently associated actual *observed* participation equality with *perceived* participation equality. Observed participation equality is a mathematical function of the distribution of participation input among group members. Perceived participation equality has been measured via questionnaire items that survey group participants for their opinion of how participation input was distributed within their group discussion. As *observed* participation equality and *perceived* participation equality are distinct operationalizations of the participation equality construct, it is possible that each would produce correspondingly distinct conclusions in the literature. This first explanation is the primary focus of this study. Second, the specific electronic collaborative meeting technology used in a research study (e.g., group support systems, Internet Meeting software, video conferencing) may very well influence the effects associated with the observed and perceived participation equality constructs. Clearly, such technology effects must be controlled and accounted for in future research. Third, other contingent and contextual factors, such as national culture have been found to moderate participation equality (Watson, Ho, and Raman, 1994; Tan, Wei, Watson, and Walczuch, 1998). We believe national culture is a highly probable explanation for observed differences across participation equality studies and we examine aspects of such an explanation in the current study.

We believe this study addresses an important gap in current IT research regarding how the participation equality construct is measured and how collaborative meeting technologies and national culture may influence participation equality. The paper begins by reviewing prior studies that have conceptualized and measured the effects of participation equality on decision-making outcomes within electronically supported group decision environments. This section concludes with statements of the study's research questions. Next, our research methodology and related findings are presented and discussed. Finally, the implications of these findings are offered.

### **Participation Equality and Group Decision Making**

Clearly, the dynamics of individuals interacting in a group are complex and difficult to predict (Zigurs and Kozar, 1994). Many factors naturally come into play, including attributes of the group, the group's members, the nature of the group task assigned, the organizational context within which the group interaction occurs, and the structure imposed on the group's interaction (Dennis, George, Jessup, Nunamaker, and Vogel, 1988; Benbasat and Lim, 1993). However, most scholars examining electronically supported group decision making agree that the extent to which a group's members fully participate in the group's deliberations may significantly affect group decision outcomes (Burke and Chidambaram, 1995). Our review of the related literature (see Table 1) revealed considerable variability in the manner in which the participation equality construct was conceptualized and measured.

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**Insert Table 1 here**  
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A number of conceptually similar constructs -- equality of participation, social equalization, influence equality, inequality of participation, and centralization of participation – have been applied in studies examining the phenomena associated with the antecedents and influences of participation equality in collaboration or group decision contexts. These constructs serve to represent the relative extent that group members have each participated and contributed to the group’s task assignment. Nonetheless, scientific advance would be better served if a greater uniformity could be observed regarding the *conceptualization* of the participation equality construct.

The measurement of participation equality, however, has proven much more problematic. Few of the studies reported in Table 1 utilized the same measurement approach. While this lack in measurement consistency is particularly prevalent with perceptual measures, differences also exist with observed measures. Such inconsistencies in measurement obviously reduce the generalizability of findings. Interestingly, our review of the participation equality literature reveals that earlier research studies tended to focus on *observed* or calculated measures of participation equality while later studies increasingly utilized *perceptual* questionnaires, i.e., Likert-scale type measures.

Finally, the overall findings and conclusions from the prior research literature are inconclusive. While some studies found that participation equality have been associated with higher group member participation (Jarvenpaa, Rao, and Huber, 1988; Mejias, Shepherd, Vogel, and Lozano, 1997) or less production blocking (Tyran, Dennis, Vogel, and Nunamaker, 1992; Chidambaram and Bostrom, 1993), other studies found that no clear patterns or significant effects emerged.

Since the group's decision-making task has been identified as one of the primary determinants in the efficacy of IT to support group work (Zigurs and Buckland, 1998), it may be that in addition to measurement issues, the nature of the group task may moderate the effect upon participation equality. Additionally, the existence of participation equality may not even be an ideal that is highly valued or recognized universally. Studies of national culture, for example, have observed that individuals from distinct cultures vary in the extent to which they value individualistic versus collectivistic behaviors (Hofstede, 1980; Triandis and Hakhom, 1994; Watson, et al., 1994). Subsequently, national culture may be an important moderating variable in understanding the effect of collaborative electronic environments upon the participation equality construct. However, the majority of empirical studies that have examined the participation equality construct have been conducted within North American settings with few studies examining participation equality within other cultural settings.

### **Research Questions**

Our review of the prior literature examining the participation equality construct generated three specific research questions. It is anticipated that if consequential answers to these research questions can be obtained, direction might be provided for future research programs that seek to study, either directly or indirectly, the participation equality construct.

**Research Question 1: Do perceptual and observed measures of participation equality move in the same direction?**

Very different findings were reported for prior studies examining participation equality. Additionally, few of these studies employed both perceptual and observed measures of participation equality. As a consequence, it is difficult if not impossible, to

determine whether these observed and/or perceptual measures are capturing the same underlying construct. If these constructs are in fact, two separate concepts, we would expect that certain outcomes would be more likely to be associated with perceptual measures and other outcomes are to be associated with observed measures.

**Research Question 2: Do collaborative electronic environments influence perceived participation equality and observed participation equality?**

Various forms of collaborative electronic meeting technologies such as computer systems for collaborative work (CSCW), electronic meeting systems (EMS), and group support systems (GSS), have been long been touted to increase the participation levels of members working within project teams (George, et al., 1990; Reinig, Briggs, Shepherd, Yen and Nunamaker, 1996), and enhance or elicit more equal participation and involvement among group members than traditional face-to-face (FtF) group meetings (Chidambaram and Bostrom, 1993; Valacich, Dennis and Connolly, 1994; Kiesler, Siegel, and McGuire, 1984). While group support systems is just one of example of many collaborative electronic technologies, we have selected GSS because IS researchers have frequently used GSS technology with the specific intent of increasing participation equality. However, other forms of collaborative meeting technology such as Internet Meeting software, email, and video conferencing, have also been of considerable interest to researchers.

**Research Question 3: Does national culture influence perceived participation equality and observed participation equality?**

As information technology (IT) assumes an increasingly global role, national culture has received growing attention by researchers as to how it may influence participation equality within group decision environments (Harvey, 1997). Clearly, the

degree of participation equality manifested within group decision-making environments may vary across national cultures (Watson et al., 1994; Tan et al., 1998). Further, it could be argued that data collected solely from participants from a single culture characterized as individualistic (e.g., the U.S.) would be limited as a “testing ground” for relationships about participation equality since subjects may exhibit little sensitivity toward or obtain little benefit from the engendering of participation equality. However, few empirical studies have been undertaken with regard to how collaborative electronic technology may affect participation equality within different cultural environments. Empirical research concerning how collaborative electronic technologies may interact within culturally diverse environments may therefore, prove to be beneficial, particularly when organizational activities must often be coordinated among various international and cross-cultural entities.

## **Research Methodology**

We conducted our participation equality study across three countries: the U.S., Hong Kong, and Spain to address the three research questions addressed above. An experimental overview of this cross-cultural study is provided in Exhibit 1.

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**Insert Exhibit 1 here**  
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All three country samples used identical task and research methodologies. The cross-cultural experimental task involved a preference task (i.e., ranking projects in order of preference) in which group members enabled the decision process by directly interacting with one another. The use of subjects from three countries also permitted an investigation of national cultural effects. Hofstede’s (1980, 1991) cultural values survey

module (VSM) was used as a pre-experimental questionnaire to measure and confirm differences between U.S., Hong Kong and Spanish participants along an “individualistic-collectivistic” dimension. The *individualistic-collectivistic* dimension (i.e., IDV index) refers to the relative importance assigned to individual goals as compared to group or collective goals. Low individualistic (IDV) or “collectivistic” cultures prefer cohesive and tightly knit social frameworks, avoid disagreement among group members and strive to maintain harmony (Hofstede, 1980, 1991). High IDV cultures, such as the U.S., are more independent and members appear to be more concerned with themselves and their immediate families. According to Hofstede’s model (1980, 1991) U.S. participants exhibit higher individualism INV scores (IDV=91) than Hong Kong (IDV=25) or Spanish participants (IDV=51).

Both observed and perceptual measures were obtained for the participation equality construct across all experimental treatments and across three national cultural samples. While some of this data was collected at the individual level, other data was derived at the group level. Perceptual measures were obtained via a post-experiment survey questionnaire.

### **Participation Equality**

**Observed Measure.** The Hiltz, Turoff & Johnson (1989) metric was used to derive an observed group-level measure of participation equality across all three cultures. This metric measures the actual distribution pattern of member participation interaction and determines whether this pattern exhibits little or much participation equality across a group’s members. Specifically, the metric examines the differences between the

expected (given participation equality) and the observed amount of participation across all group members. A score of 1.0 represents perfect equality, while a score of 0.0 represents that only a single person in the group participated. At the individual level of analysis, the same group-level score was used for each of a group's members. This measure is described in Exhibit 2

**Perceptual Measure.** Three items were combined to measure perceived participation equality across the three cultural samples: (*Chronbach alpha=0.80*):

PPE1: *“Everyone in my group contributed about the same amount in the group session”*

PPE2: *“Participation in this group exercise was equally divided among all the group members”*

PPE3: *“Everyone in the group contributed about the same number of ideas during the group session”*

A 7-point scale was used for the questionnaire items, with “1” representing the lowest level of perceived participation equality and a “7” representing the highest level.

## **The Study's Findings**

In our study, perceptual measures of participation equality (PE) were captured at the individual level, while observed measures were captured at the individual and group level. The observed measure (as a mathematical function of group behavior) represents the actual distribution of comments that took place during the discussion. We analyzed this data at the individual level of the analysis by comparing an individual's perceived participation equality to the observed participation equality for the group. While the observed PE was constant for each individual within a group, perceived PE was likely to vary from person to person.

**RQ1: Do perceptual and observed measures of participation equality (PE) move in the same direction?**

From the “All Experimental Groups” column of Table 2, significant correlations ( $p < 0.01$ ) were observed between measures of perceived PE and observed PE across all three national samples. For U.S. and Hong Kong groups as a total, correlations between perceived and observed (PE) were highly significant and moved in the same (positive) direction. However, for the Spanish groups as a total, correlations between perceived and observed (PE) were highly significant and but in a negative direction. For U.S. and Hong Kong face-to-face (FtF) groups, correlations between perceived and observed (PE) were significant and moved in the same (positive) direction. While significant (positive) correlations between perceived PE and observed PE were indicated for U.S. FtF and GSS-anonymous groups, a negative correlation was indicated for Spanish GSS-identified groups. The Hong Kong sample indicated positive correlations between perceived PE and observed PE only for their FtF groups. Otherwise, similar patterns in associations between perceived and objective measures were not observed across the national cultures or across treatment groups.

**RQ2: How does collaborative electronic meeting technology influence participation equality (PE)?**

There was no consistent influence of collaborative electronic technology upon participation equality across experiment treatments. Different applications of collaborative electronic technology clearly generated varying effects within different cultural samples. GSS-identified groups for the Spanish sample indicated a significant correlation between perceived PE and observed PE, though this association was negative.

For GSS-anonymous groups, only U.S. groups indicated a significant (positive) correlation between perceived PE and observed PE. Interestingly, FtF groups generated a significant correlation (positive) between perceived PE and observed PE for both U.S. and Hong Kong FtF groups, but there were no similar correlations for Spanish FtF groups.

**RQ3: Is the participation equality concept moderated in a consistent fashion by national culture?**

The results from our first two research questions suggest that national culture may moderate technology's effect upon participation equality. As expected, the effect of collaborative electronic technology across all three cultures was inconsistent. For the U.S. sample, a positive association between observed PE and perceived PE was indicated for both GSS-anonymous and FtF groups. Hong Kong FtF groups also demonstrated a positive correlation between observed PE and perceived PE. However, Spanish GSS-identified groups indicated a negative correlation between observed PE and perceived PE. It is noteworthy that while Spain (IDV=51) indicated a higher IDV index than Hong Kong (IDV=25), (Hofstede, 1980, 1991); the correlation between observed PE and perceived PE was negative. However, no clear patterns as related to cultural individualistic or collectivist tendencies were noted for participation equality across any national sample.

## **Discussion and Conclusion**

The study was undertaken with the objective of shedding light on the viability of different measurement strategies regarding the participation equality (PE) construct. It was expected (if one assumes that *observed* and *perceived* measures of participation

equality operate in a similar fashion) that an interactive group task (as employed in this study) would engender rich exchanges among group participants, producing consistencies in observed and perceived PE measures across the groups. However, our results produced inconsistent correlations between observed and perceived PE measures – across experimental treatments and across national cultures.

While significant correlations between observed PE and perceived PE were indicated across all three cultures, only U.S. and Hong Kong groups indicated positive correlations. Spanish groups on the contrary, indicated negative correlations between observed and perceived PE measures for entirely different experimental treatments. The two approaches used to measure participation equality in this study seem to, as conjectured, operate very differently across distinct contexts, strongly suggesting that *observed* PE and *perceived* PE may be uniquely different constructs and may not always correlate in the same direction. Subsequently, such inconsistent operationalizations of PE may lead to inconsistent conclusions regarding participation equality.

As a consequence, we offer two recommendations for researchers undertaking future studies that examine the participation equality construct. First, we advocate the use of both objective and perceptual measures in accurately gauging the role of participation equality. Not only does such a research strategy allow these measures to cross-validate one another, but also counteracts situational tendencies for perceptual measures to “perform” better with perceived outcomes and for observed measures to “perform” better with observed outcomes. Additionally, while objective algorithms may measure the actual equality of participation input during decision making, perceptual measures may offer insight into how committed group members may be in implementing

a group decision, particularly with regard to their perception as to whether they were given a fair opportunity to input into the decision process.

While scholars studying group decision making frequently invoke the participation equality construct, there have been surprisingly few empirical studies that have rigorously examined participation equality. Collectively, little seems to be known about when and how participation equality affects group outcomes. We strongly encourage such research programs, and we hope our offered recommendations regarding the use of perceptual and observed participation equality measures prove useful to those scholars undertaking this research.

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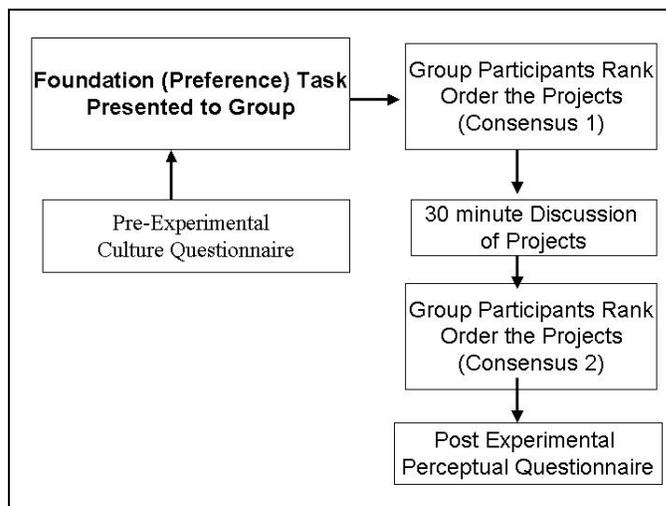
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## **Exhibit 1 The U.S.- Hong Kong – Spain Study**

- Groups:** 259 participants from the U.S. (33 groups), 197 participants from Hong Kong (26 groups), and 205 participants from Spain (27 groups) were used as the sample base for this cross-cultural study. Group size was 7-8 for all groups. Groups were randomly divided into three experimental treatments: anonymous GSS, identified GSS, and Control (FtF). All three cultural samples consisted of MIS or business administration college undergraduates from large universities.
- Procedure:** Each group was assigned a resource allocation task that required group members to rank-order nine community projects. Group members were asked to rank-order the projects prior to any discussion and a consensus statistic was calculated from this ranking. The group was then given 30 minutes to discuss the relative merits of each of the community projects. After the discussion, the group was asked to rank-order the projects a second time, generating a second consensus statistic. A native English speaker conducted sessions for the Hong Kong groups (both FtF and GSS) in English, which was also the language used at the Hong Kong University attended by the participants. The Spanish experiments were conducted in Spanish and the questionnaire instruments were translated into Spanish
- Measurement:** Transcripts of the electronic discussions were examined to measure observed participation equality for the GSS groups. For manual groups, two researchers observed the group discussion and independently recorded the number of comments directed to the group by each participant. Perceived participation equality and other perceptual measures were collected using a 45-item post-experimental questionnaire.

### ***Experimental Overview***



## Exhibit 2. Formula for Calculating Observed Participation Equality

*Actual (Observed) Participation Equality Level* - was calculated by examining the transcripts of the group discussions and using the distribution of actual comments by each group member to derive an observed group-level measure of participation equality. Equality ( $E$ ) was calculated using this distribution and an equation adapted from Hiltz, Turoff & Johnson (1989) who report a participation inequality measurement referred to as  $I$ .

$$\text{Participation Equality } (E) = 1 - I, \text{ where } I = \frac{\frac{1}{N} \sum_{i=1}^N (E_i - O_i)}{\frac{1}{2} \left(1 - \frac{1}{N}\right)}$$

To calculate  $I$ , the comment distribution must be sorted in ascending order.  $N$  equals the group size for a particular meeting.  $E_i$  and  $O_i$  are both monotonically increasing where  $E_i$  is the expected cumulative portion of comments and  $O_i$  is the observed cumulative portion of comments. Here, a score of 1 represents perfect equality and a score of 0 denotes that only a single person in the group participated.

**Table 1. Prior Participation Equality (PE) Research**

<i>Study</i>	<i>PE Variant of Interest</i>	<i>Task Type</i>	<i>How PE was Measured</i>	<i>Effect of PE on Outcome Variables</i>
Kiesler, Siegel, and McGuire, 1984	Inequality of Participation	Decision Making	Observed: distribution of individual remarks as a proportion	Greater PE associated with more uninhibited verbal behavior, greater decision shifts, and more time to decision
Siegel, Dubrovsky, Kiesler and McGuire, 1986	Social Equalization	Decision Making Consensus	Observed: average relative standard deviation of group member participation rates	Greater PE associated with reduced consensus
Jarvenpaa, Rao, and Huber, 1988	Equality of participation	Idea Generation Preference	Observed: standard deviation of member's total participation	Greater PE associated with more input and with higher participant satisfaction
Hiltz, Turoff, and Johnson (1989)	Equality of Participation	Preference	Observed: difference between expected proportion of participant comments assuming complete equality	No significant associations
George, Easton, Nunamaker and Northcraft, 1990	Participation Rate	Creative Intellective	Observed: average relative standard deviation of group members' participation rates	Greater PE (with GSS groups) associated with longer decision time
Poole, Holmes and DeSanctis, 1991	Equality of Member Participation	Preference	Perceptual: questionnaire	Greater PE associated with increased conflict and less consensus
Lea and Spears, 1991	Inequality of Participation	Decision Making	Perceptual: questionnaire	No significant associations
Tyran, Dennis, Vogel, and Nunamaker, 1992	Equality of Participation	Wide range	Perceptual: questionnaire	Greater PE associated with more information sharing, more synthesis, less production blocking
McLeod and Liker, 1992	Participation Equality	Planning Creative	Perceptual: questionnaire	No significant associations
Chidambaram and Bostrom, 1993	Participation Equality	Decision Making	Observed verbal behavior and one perceptual questionnaire item	Greater PE (in GSS groups) associated with higher performance, creativity, and less production blocking

<i>Study</i>	<i>PE Variant of Interest</i>	<i>Task Type</i>	<i>How PE was Measured</i>	<i>Effect of PE on Outcome Variables</i>
Turoff, Hiltz, Bahgat and Rana, 1993	Degree of Participation	Wide range	Perceptual: questionnaire	No significant associations
Herschel, Cooper, Smith and Arrington, 1994	Personal Participation	Decision Making Creative	Perceptual: Green and Taber (1980) personal task participation scale	No significant associations
Watson, Ho and Raman, 1994 ( <i>CACM</i> )	Equality of Influence	Preference Allocation	Perceptual: distance / difference between each participant's pre-meeting decision and group decision and degree of member domination	High pre-meeting consensus levels had effect of less equality of influence levels (more dominance)
Burke and Chidambaram, 1995	Equality of Participation	Policy Making	Perceptual: questionnaire	Greater PE associated with greater coordination and leadership effectiveness
Berdahl and Craig, 1996	Centralization of Participation and Influence	Decision Making	Observed: member participation Perceptual: ratings of peer and self participation	No significant associations
Mejias, Shepherd, Vogel and Lozano, 1997	Participation Equality	Idea generation Preference	Perceptual: questionnaire	Greater PE associated within higher decision satisfaction
Tan, Wei, Watson, Walczuch, 1998 ( <i>JMIS</i> )	Perceived influence	Intellective and preference task	Perceptual questionnaire	Perceived influence affected by task type and communication medium. Interactive effects with national culture
Pinsonneault, Barki, Gallupe and Hoppen, 1999( <i>ISR</i> )	Group member involvement	Idea generation	Perceived measure (2 items) of group member involvement	Involvement not correlated to other dependent variables. Satisfaction negatively correlated with No. of ideas and electronic brainstorming

**Table 2. P.E. Results-By Country and Experimental Treatment**

	United States sample (n = 259)							
	<i>FtF-Control (n= 83)</i>		<i>GSS-Identified (n=88)</i>		<i>GSS-Anonymous (n = 88)</i>		<i>All Experimental Groups</i>	
	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.
<b>Observed P.E. Index</b>	<b>.248*</b>	1.00	.092	1.00	<b>.282**</b>	1.00	<b>.327**</b>	1.00
<b>Mean value,</b>	3.74	.618	4.48	.769	4.53	.846	4.27	.747
<b>standard deviation</b>	1.191	.064	1.223	.063	1.249	.0422	1.269	.109
	Hong Kong sample (n =197)							
	<i>FtF- Control (n= 68)</i>		<i>GSS-Identified (n=61)</i>		<i>GSS-Anonymous (n = 68)</i>		<i>All Experimental Groups</i>	
	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.
<b>Observed P.E. Index</b>	<b>.401**</b>	1.00	.113	1.00	.128	1.00	<b>.552**</b>	1.00
<b>Mean value,</b>	3.35	.611	4.79	.917	4.54	.865	4.21	.794
<b>standard deviation</b>	1.052	.090	1.107	.064	1.001	.062	1.223	.153
	Spain sample (n = 205)							
	<i>FtF-Control (n= 68)</i>		<i>GSS-Identified (n=69)</i>		<i>GSS-Anonymous (n = 68)</i>		<i>All Experimental Groups</i>	
	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.	Perceived P.E.	Observed P.E.
<b>Observed P.E. Index</b>	.142	1.00	<b>-.298*</b>	1.00	-.138	1.00	<b>-.196**</b>	1.00
<b>Mean value,</b>	3.93	.728	3.11	.798	3.56	.816	3.53	.781
<b>standard deviation</b>	.941	.059	.991	.048	1.121	.073	1.070	.071