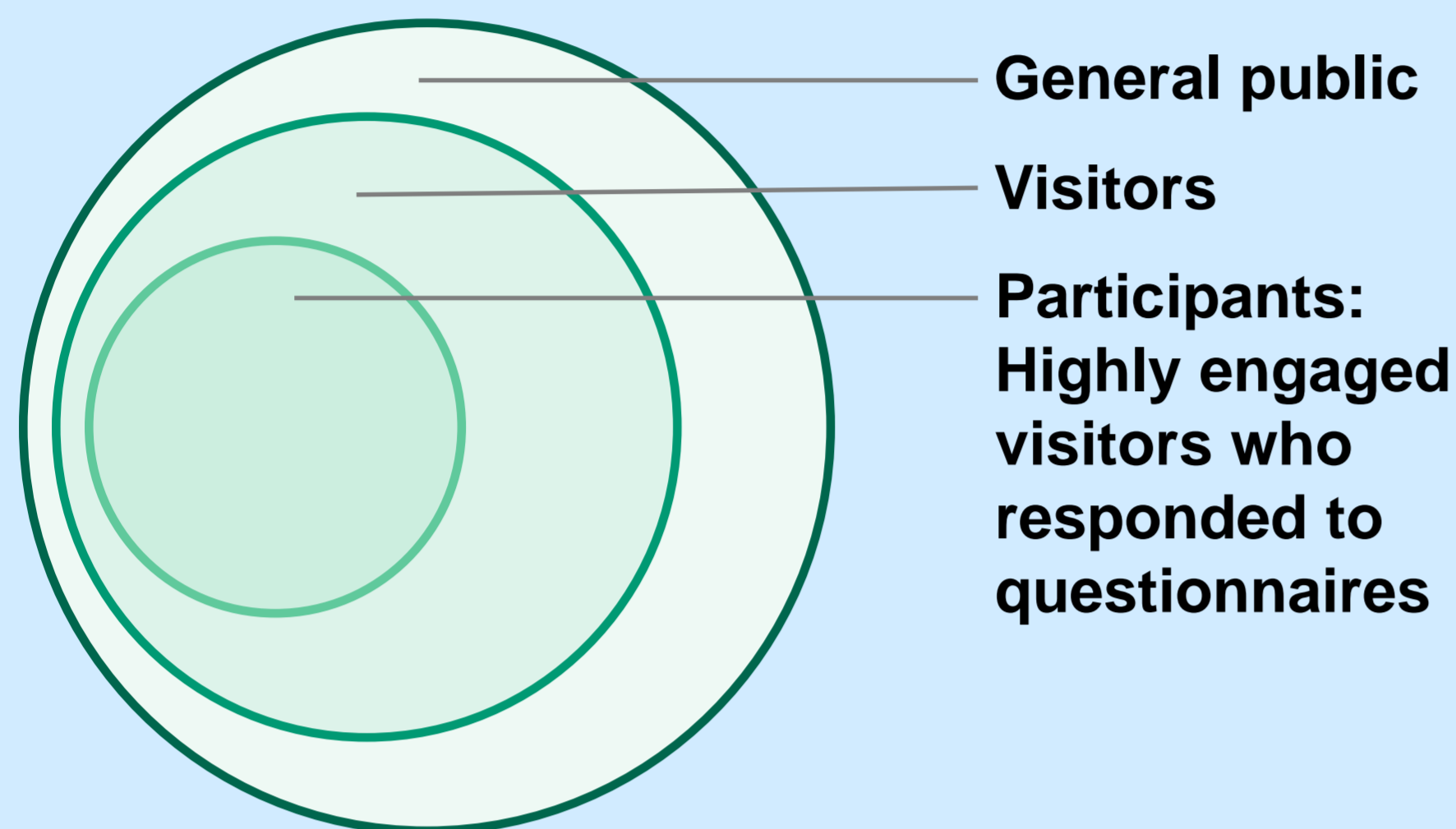# Understanding public, visitors, and participants in science events

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Despite the promotion of public engagement in science, there has been little empirical research on the sociocultural and attitudinal characteristics of participants in science events and the extent to which such individuals are representative of the general population. We statistically investigated the distinctiveness of visitors to a scientific research institution by contrasting samples from visitor surveys and nationally representative surveys. The visitors had more cultural capital (science and technology/art and literature) and believed more in the value of science than the general public, but there was no difference regarding assessment of the levels of national science or of the national economy. A deeper examination of the variations in the visitors' exhibit-viewing behaviors revealed that individuals with more scientific and technical cultural capital viewed more exhibits and stayed longer at the events. This trend in exhibit-viewing behaviors remained consistent among the different questionnaire items and smart-card records.

Method

General public

Visitors

Participants: Highly engaged visitors who responded to questionnaires

Data

Survey 1: 2009 visitor survey at the Institute for Molecular Science (IMS).
Survey 2: 2012 visitor survey at the IMS
Survey 3: 2013 Japanese National Character Survey
Survey 4: 2014 web-based survey of Japanese citizens
*In Survey 2, smart cards were distributed to the visitors with the questionnaires. The ID numbers for each card–questionnaire pair were matched in advance.

Hypotheses

H1: Participants in science events hold greater cultural capital (both science & technology and Literally and artistic) than the general public.
H2: Participants in science events show more favorable attitude toward the value of scientific research than the general public.
H3: Participants' assessments of the level of science, art, or economy in their own country are not different from those of the general public.
H4: Total viewing time and the total number of exhibits viewed are greater for questionnaire respondents than for nonrespondents.
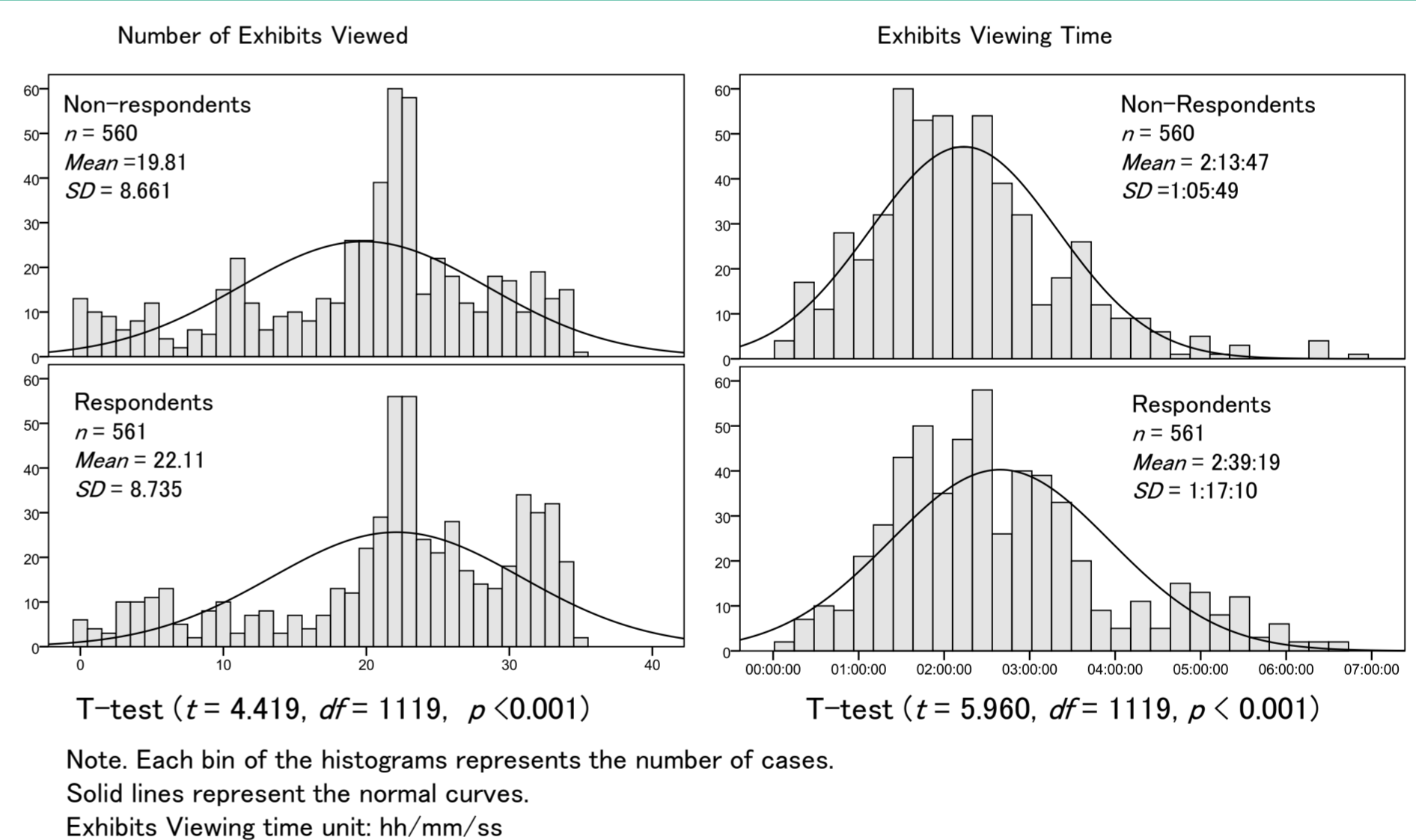
Scope of the study

Purpose of Analysis	Group Comparison	Hypothesis
Purpose1: Group Distinctiveness of Participants	Beneral public & Participants	H1: Differences in cultural capital
		H2 & H3: Differences in attitudes and opinions
Purpse2 : Variations in Visitor Behaviors	Visitors & Participants	H4: Differencs in exhibit viewing behaviors
	Within Participants	H4: Determinants of exhibit viewing behaviors

Differences in cultural capital

Items	Survey 4 (n=974)		Survey 2							
			crude (n=287 to 299)				adjusted(n=269 to 286) [*1*2]			
	mean	SE	mean	SE	Man-Whitney's U	p-value	mean	SE	Man-Whitney's U	p-value
1. Science museum	1.42	0.024	2.17	0.047	14.996	0.000	2.07	0.049	12.255	0.000
2. Science café	1.19	0.018	1.87	0.054	14.541	0.000	1.73	0.052	13.200	0.000
3. Science TV	1.44	0.029	2.80	0.072	18.175	0.000	2.64	0.076	15.943	0.000
4. Science magazine	1.89	0.038	3.25	0.068	15.210	0.000	3.06	0.075	13.338	0.000
5. Classic music	1.49	0.026	2.06	0.060	9.006	0.000	1.90	0.060	6.796	0.000
6. Art museum	1.75	0.030	2.65	0.052	13.140	0.000	2.47	0.054	11.098	0.000
7. Novels	2.45	0.047	3.29	0.073	8.286	0.000	3.16	0.080	7.115	0.000
8. Kabuki	1.29	0.021	1.50	0.047	4.592	0.000	1.47	0.045	4.666	0.000

1: Going to a science museum or planetarium
2: Going to a science lecture, science event, or science cafe
3: Reading a science magazine or science book
4: Watching a science program on television or going to see a science movie
5: Going to a classical music performance or concert
6: Going to an art museum or other (nonscience) museum
7: Reading novels or history books
8: Going to Kabuki, Noh, Bunraku, or other traditional Japanese art performances

Differences in attitudes and opinions

Items/Categories	Survey 3 [*2] (n=1579/1572)		Survey2							
			crude (n=299 to 302)				adjusted(n=261 to 292) [*1*3]			
	%	SE	%	SE	Diff test's Z [*4]	Chi-squared Test & p value	%	SE	Diff test's Z [*4]	Chi-squared Test & p value
Item 1 Science improves daily life?										
1.A lot	38.9%	1.224%	70.9%	2.658%	10.942	277.002	61.9%	4.402%	5.037	85.883
2.A little bit	45.7%	1.251%	23.6%	2.486%	-7.945	(df=3)	31.2%	4.318%	-3.229	(df=3)
3.Not at all	10.4%	0.767%	1.0%	0.590%	-9.695	0.000	1.3%	1.027%	-7.073	0.000
4.Other/Don't know	5.0%	0.547%	4.5%	1.207%	-0.402		5.6%	2.225%	0.248	
Item 2. Level of S & T in Japan										
1.Very high	34.7%	1.201%	35.7%	2.809%	0.329	2.624	38.5%	4.528%	0.810	3.070
2.Fairly high	52.2%	1.260%	49.1%	2.931%	-0.967	(df=3)	46.1%	4.550%	-1.299	(df=3)
3.Low(fairly/very)	7.3%	0.657%	9.6%	1.729%	1.247	0.453	9.6%	2.650%	0.853	0.381
4.Other/Don't know	5.7%	0.586%	5.5%	1.336%	-0.156		5.7%	2.332%	0.003	
Item 3. Artistic achievement of Japan										
1.Very high	18.8%	0.924%	18.8%	2.417%	1.085	27.557	19.2%	3.797%	0.825	7.704
2.Fairly high	60.9%	1.231%	51.7%	3.093%	-2.750	(df=3)	53.7%	4.760%	-1.459	(df=3)
3.Low(fairly/very)	15.8%	0.919%	25.7%	2.704%	3.465	0.000	22.9%	3.892%	1.772	0.053
4.Other/Don't know	7.4%	0.659%	3.8%	1.188%	-2.611		4.2%	2.274%	-1.324	
Item 4. Economic achievement of Japan										
1.Very high	5.4%	0.570%	8.3%	1.623%	1.684	9.882	7.9%	2.546%	0.945	5.470
2.Fairly high	43.8%	1.251%	37.4%	2.846%	-2.057	(df=3)	39.8%	4.482%	-0.854	(df=3)
3.Low(fairly/very)	47.5%	1.259%	51.9%	2.939%	1.391	0.020	50.6%	4.471%	0.680	0.140
4.Other/Don't know	3.4%	0.455%	2.4%	0.904%	-0.938		1.7%	0.772%	-1.840	

Differences in exhibit viewing behaviors

Number of Exhibits Viewed

Non–respondents
$n = 560$
Mean =19.81
SD = 8.661

Respondents
$n = 561$
Mean = 22.11
SD = 8.735

T–test ($t = 4.419$, $df = 1119$, $p < 0.001$)

Exhibits Viewing Time

Non–Respondents
$n = 560$
Mean = 2:13:47
SD =1:05:49

Respondents
$n = 561$
Mean = 2:39:19
SD = 1:17:10

T–test ($t = 5.960$, $df = 1119$, $p < 0.001$)

Note. Each bin of the histograms represents the number of cases.
Solid lines represent the normal curves.
Exhibits Viewing time unit: hh/mm/ss

Determinants of exhibit viewing behaviors

		Exhibit Viewing Behaviors													
		Survey1						Survey2							
Variables		Number			Time			Number						Time	
		Model 1 (Questionnaire)			Model 2 (Questionnaire)			Model 3 (Questionnaire)			Model 4 (Smart Card Record)			Model 5 (Smart Card Record)	
		B	95%CI	β	B	95% CI	β	B	95%CI	β	B	95% CI	β	B	95% CI	β
Constant		6.271[†]	[-0.211, 12.752]		1.390***	[0.750, 2.031]		28.159***	[17.016, 39.302]		25.346***	[19.011, 31.681]		129.501***	[73.013, 185.989]	
Gender		-1.792	[-4.312, 0.728]	-0.078	0.084	[-0.167, 0.335]	0.039	0.265	[-3.438, 3.967]	0.009	-0.450	[-2.598, 1.697]	-0.025	-3.475	[-22.685, 15.734]	-0.021
Age		0.579	[-0.385, 1.542]	0.067	0.059	[0.038, 0.156]	0.072	-0.809	[-2.338, 0.720]	-0.073	-0.644	[-1.511, 0.224]	-0.091	-1.158	[-8.884, 6.567]	-0.018
Education		-3.056*	[-5.839, -0.272]	-0.117	0.142	[-0.133, 0.418]	0.058	-4.105*	[-8.115, -0.096]	-0.130	-1.288	[-3.565, 0.989]	-0.065	15.945	[-4.281, 36.170]	0.089
Group Formation		-0.664	[-3.545, 2.217]	-0.025	-0.032	[-0.318, 0.254]	-0.013	2.272	[-2.744, 7.287]	0.060	2.586[†]	[-0.378, 5.549]	0.102	43.596**	[16.976, 70.217]	0.188
STC		0.754***	[0.364, 1.144]	0.225	0.073***	[0.035, 0.111]	0.236	0.748*	[0.163, 1.333]	0.167	0.081	[-0.257, 0.419]	0.029	3.536*	[0.535, 6.536]	0.139
LAC		-0.024	[-0.485, 0.436]	-0.006	-0.015	[-0.060, 0.030]	-0.043	-0.319	[-0.992, 0.354]	-0.062	0.032	[-0.361, 0.426]	0.010	-0.867	[-4.356, 2.621]	-0.029
F (df1, df2)		4.601** (6, 354)			3.286** (6, 325)			1.975[†] (6, 247)			1.403 (6, 305)			3.639[†] (6, 302)		
R^2		0.072			0.057			0.046			0.027			0.067		
Adjusted R^2		0.057			0.040			0.023			0.008			0.049		
n		361			332			254			312			309		

Conclusion

There are not only differences between visitors to the exhibitions and the general public but also differences between visitors who participated by completing the questionnaire and those who did not.
Participants tended to appreciate the value of science, have more cultural capital than the general public, and hence, participate in scientific activities, and they also engaged in more exhibit-viewing behaviors than other visitors. Hence, the participants of science events are, indeed, distinct not only from the general public but also from the lower engaged visitors.