How Many Options? Behavioral Responses to Two Versus Five Alternatives Per Choice

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How many alternatives/task in past Sawtooth Software presentations?

Studies Proceedings	Pairs—2	Triples—3	Quads—4	Quints—5 or more
2010	0%	20%	15%	65%
2012	5%	30%	20%	45%
2013	10%	40%	20%	30%
2015	0%	70%	20%	10%

- Pairs are very rare
- Five or more were common and are becoming rare
- Triples are emerging as the dominant choice task

Four questions

1. What is right/wrong with pairs?
2. What is right/wrong with quints?
3. How do they differ in terms of process?
   - Eye-tracking measures of time, coverage, decision process
   - Attitudes towards the tasks
   - Predictive accuracy
4. When should either be used?

Eye tracking equipment used

- 4 Tobii T120 remote eye tracking system
- Accuracy of 0.4° of visual angle
- Sampling rate of 120 Hz
- 17’’ TFT monitor with a resolution of 1280 x 1024 pixels
- 9-point calibration and recalibration if necessary
- We used standard Tobii fixation filter

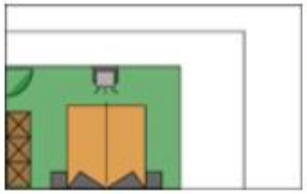
A study of beach hotel choices

- Eight choices among groups of hotels for a weekend trip differing on
  - Price ($699-$899)
  - Percent good consumer rating (50%-90%)
  - Distance from central business district (1-3 km)
  - Food quality (Good, Very Good, Excellent)
  - Sea view (None, Side, Full)
  - Room (Standard, Superior, Deluxe)
- Respondents saw either eight pairs (n=39) or quints (n=38)

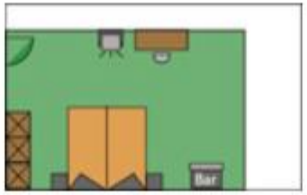
Room category attribute

Room category

Hotel rooms also vary with respect to the size of the room as well as the amenities and the facilities offered. Three different room categories are available:



Standard rooms: The standard rooms are well appointed and perfectly suited for all your needs. The average size is 25 square meters.



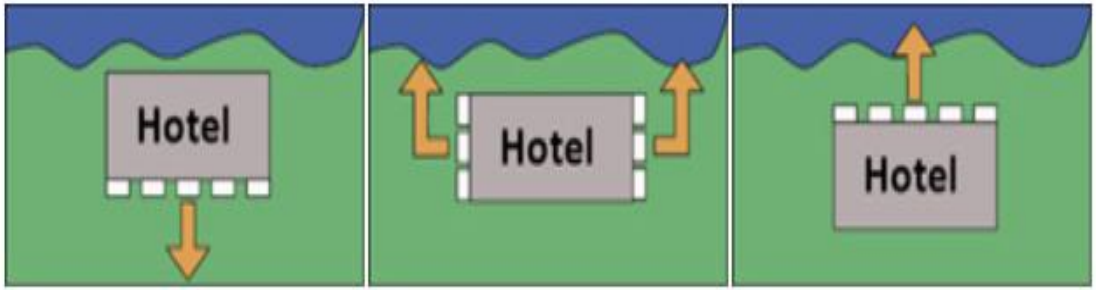
Superior rooms: The Superior rooms are larger than the standard rooms, with an average size of 30 square meters and a King bed.

Deluxe rooms: The Deluxe rooms are luxurious and spacious with an average size of 45 square metres including a seating area with chairs or sofa. Amenities and facilities include a King bed, en-suite bathroom, high-speed internet access, flat-screen television and an electronic safe.

Sea view category

Sea view

The rooms in your hotel also vary in terms of whether they have a sea view. Some hotels offer you a room with a full sea view, while others offer a side sea view or no sea view at all.



A choice between pairs

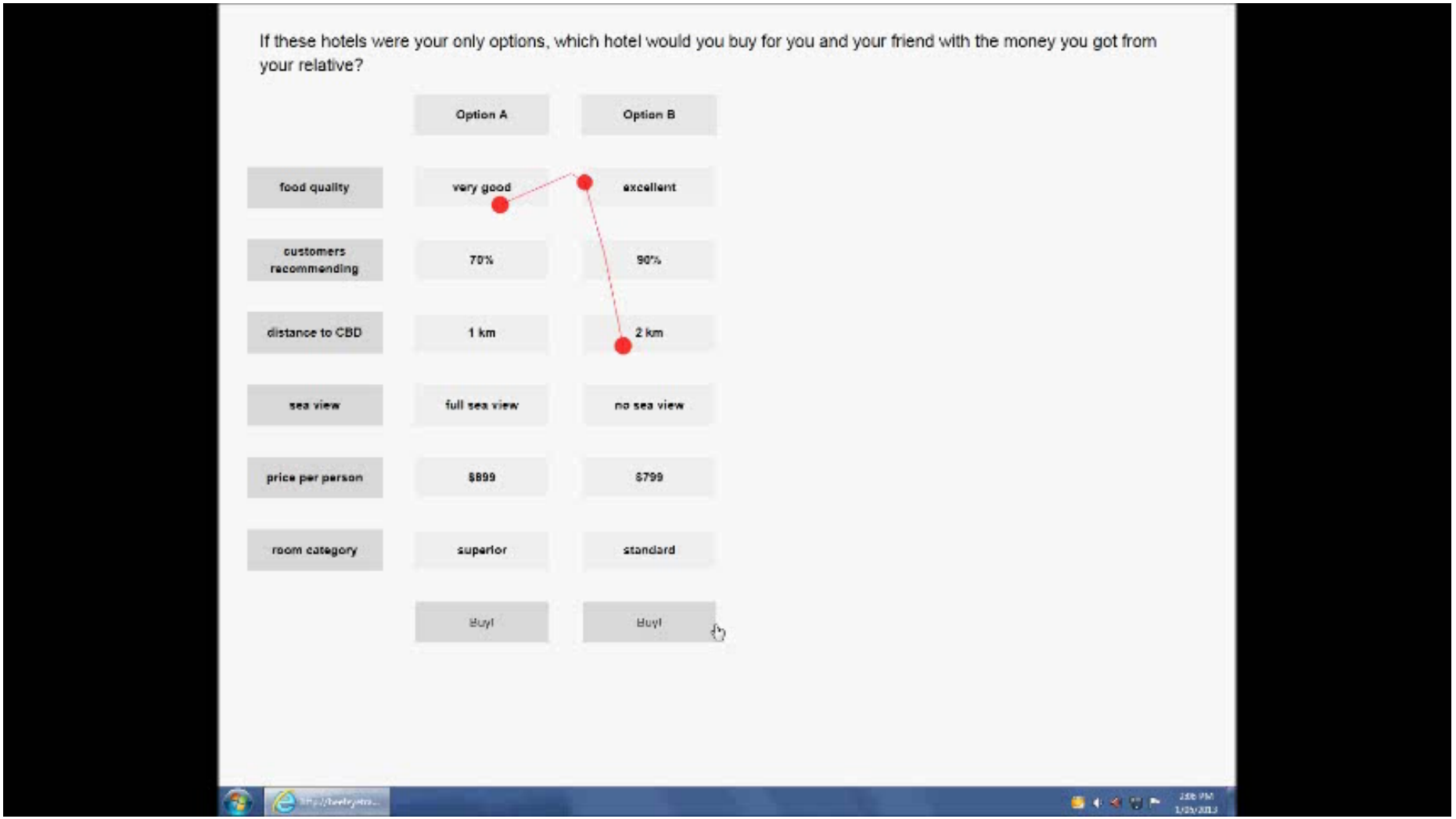
If these hotels were your only options, which hotel would you buy for you and your friend with the money you got from your relative?

	Option A	Option B
food quality	excellent	very good
customers recommending	50%	90%
distance to CBD	3 km	1 km
sea view	side sea view	full sea view
price per person	$699	$799
room category	standard	deluxe
	Buy!	Buy!

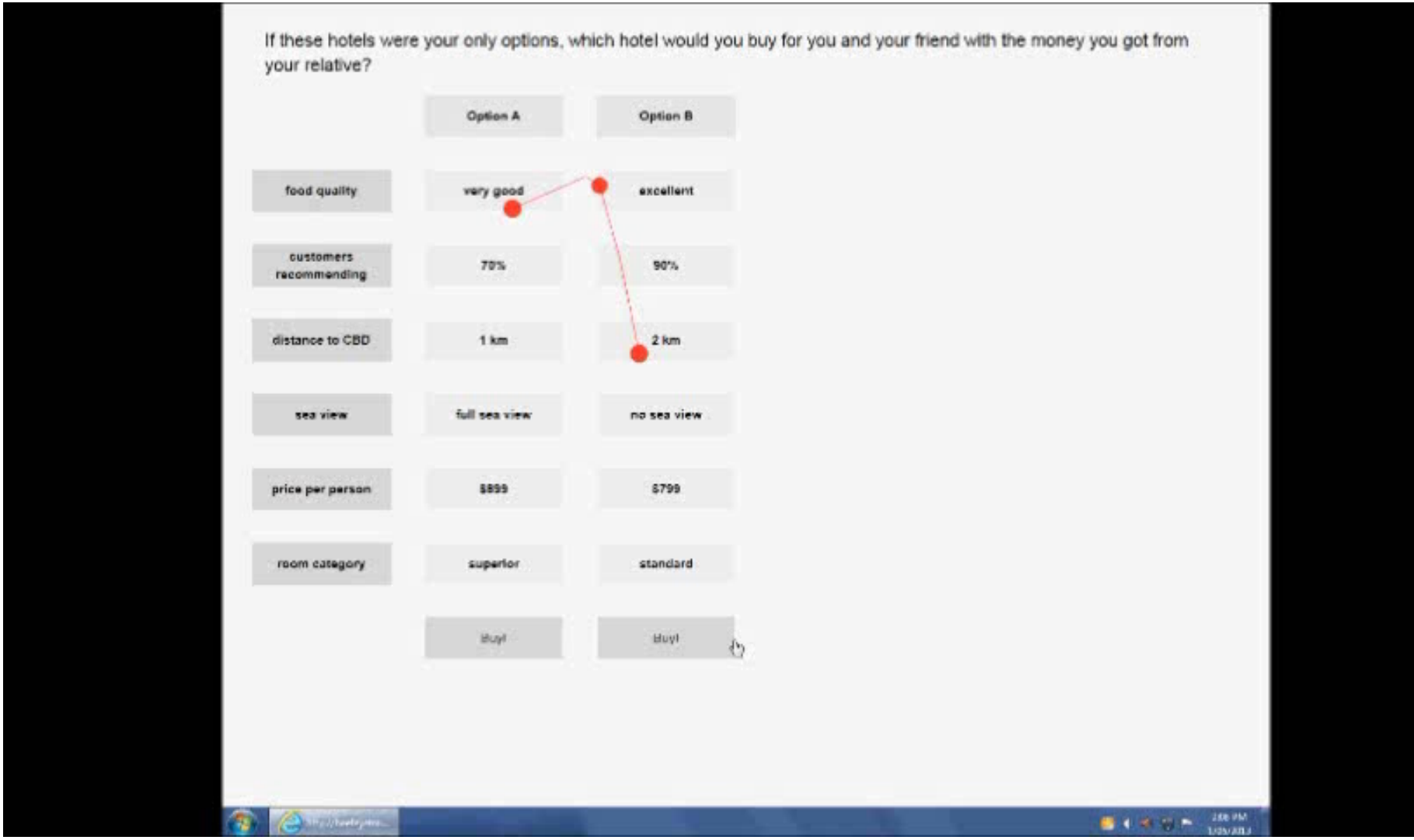
Expected behavior for pairs

- Pairs will generate additive difference processing that compared with quints is
  - Faster and has fewer operations
  - Processes a greater percent of the information
  - Puts greater focus on less important attributes

Information processing in pairs (video)



Information processing in pairs (video)



Slow motion

A choice among five options

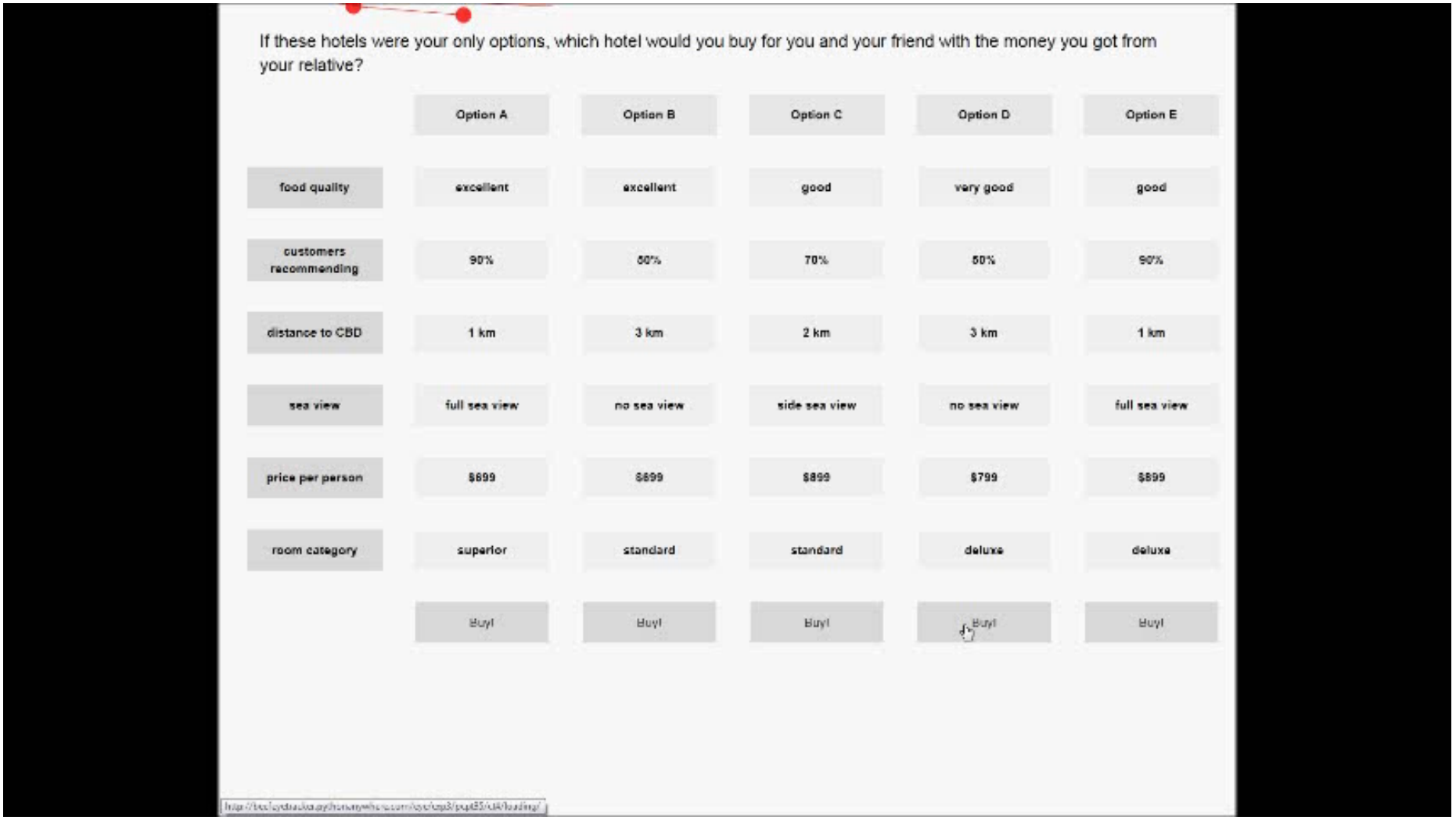
If these hotels were your only options, which hotel would you buy for you and your friend with the money you got from your relative?

	Option A	Option B	Option C	Option D	Option E
food quality	very good	good	very good	excellent	excellent
customers recommending	90%	90%	70%	50%	50%
distance to CBD	1 km	1 km	3 km	2 km	2 km
sea view	no sea view	side sea view	no sea view	side sea view	full sea view
price per person	$699	$799	$899	$899	$699
room category	standard	deluxe	standard	deluxe	superior
	Buy!	Buy!	Buy!	Buy!	Buy!

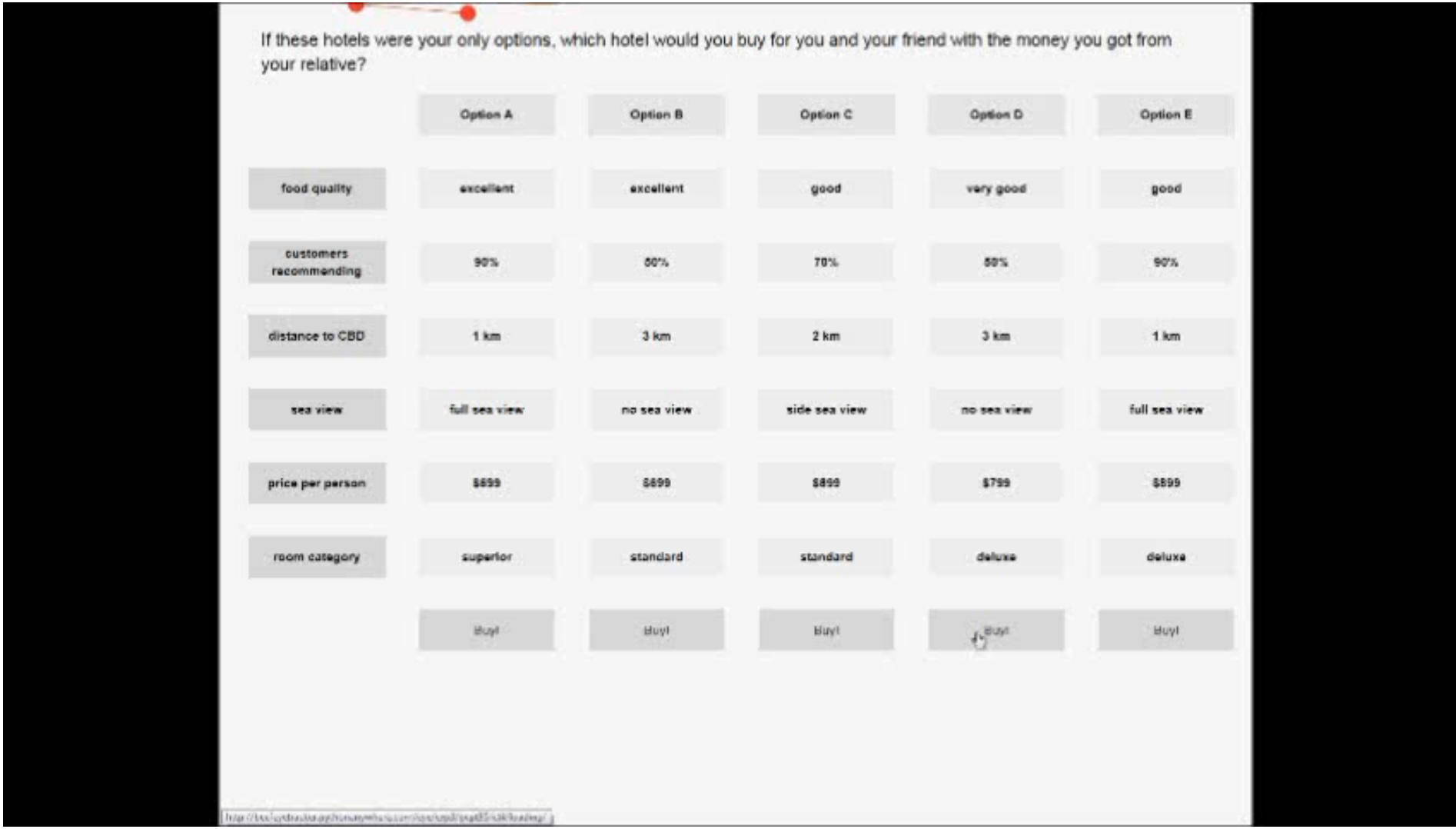
Expected behavior for quints

- Will result from a truncated search which results from early focus on the eventually chosen alternative
- Greater simplification as key attributes are identified
- More likely to simplify with non-linear cutoff

Information processing in quints (video)



Information processing in quints (video)



Slow motion

What did we find?
Processing differences, pairs vs quints

- Respondents attend to a greater percent of the available information for pairs (92%) compared with quints (69%)
- Pairs generate greater time per fixation consistent with more processing of the information…differencing and adding
- Switching for pairs is predominately within attribute (M=-2.1, SE=.5) while for quints it is primarily within alternative (M=.5, SE=.3)
- Non adjacent switches 14% for pairs and 29% for quints

Task perceptions

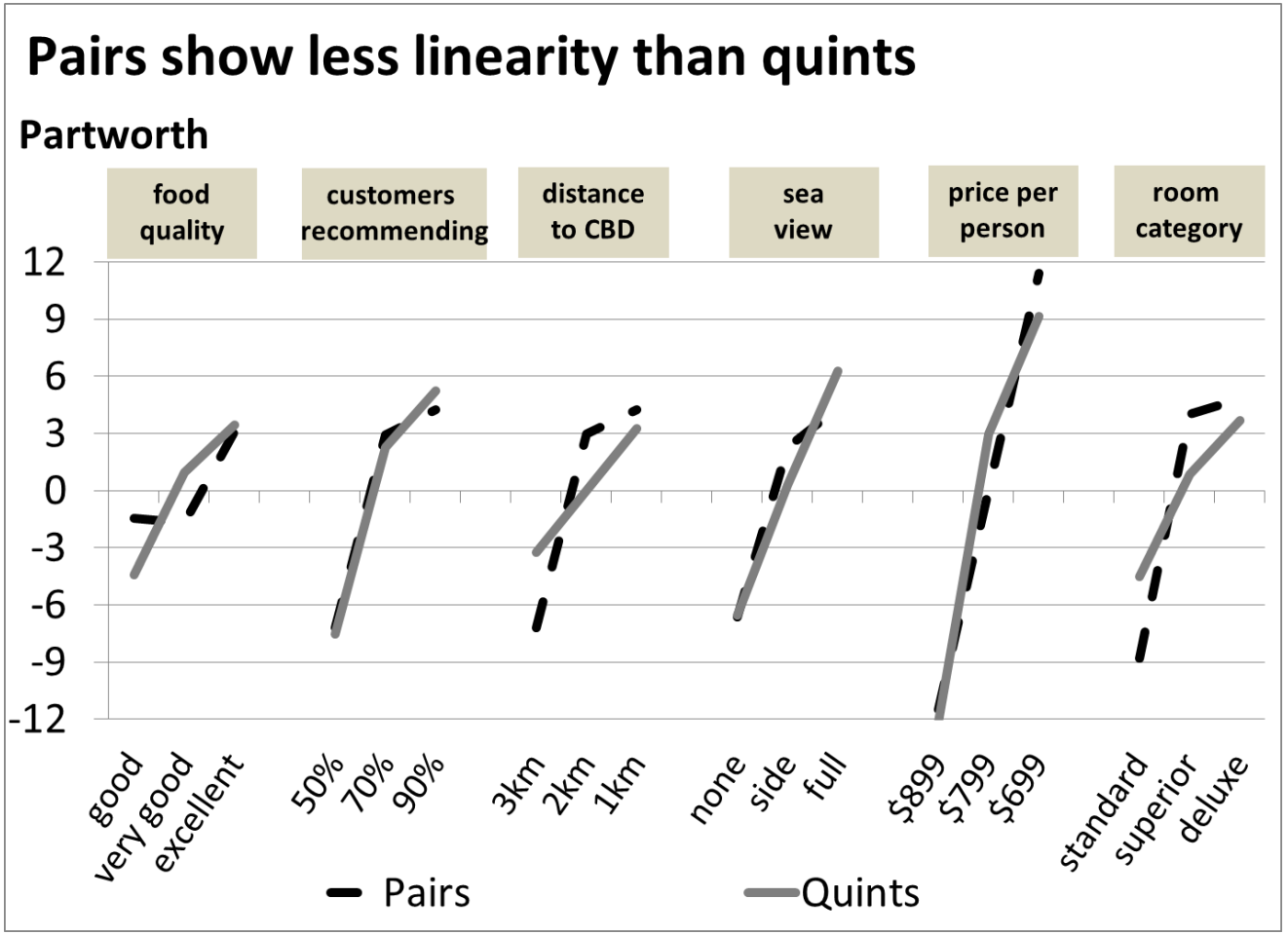
- Respondents characterize pairs as generating more maximizing behavior (M=6.5, SE=.9), Quints (M=5.4, SE =.8; t=1.0, p=.3), [Scale: 1: satisficing; 7: maximizing; see Schwartz et al. 2008]
- Pairs are perceived to be more difficult (M=.6, SE=.2) than quints (M=-.4, SE=.3), [Scale: -3: not at all difficult; 3: extremely difficult]

Expected performance differences

- Pairs are 30% less statistically efficient. Thus, if error is the same they require 30% more tasks to generate the same predictive accuracy.
- However, pairs should be more consistent, suggesting that internal fit will be greater, however they may be less able to predict holdout triples

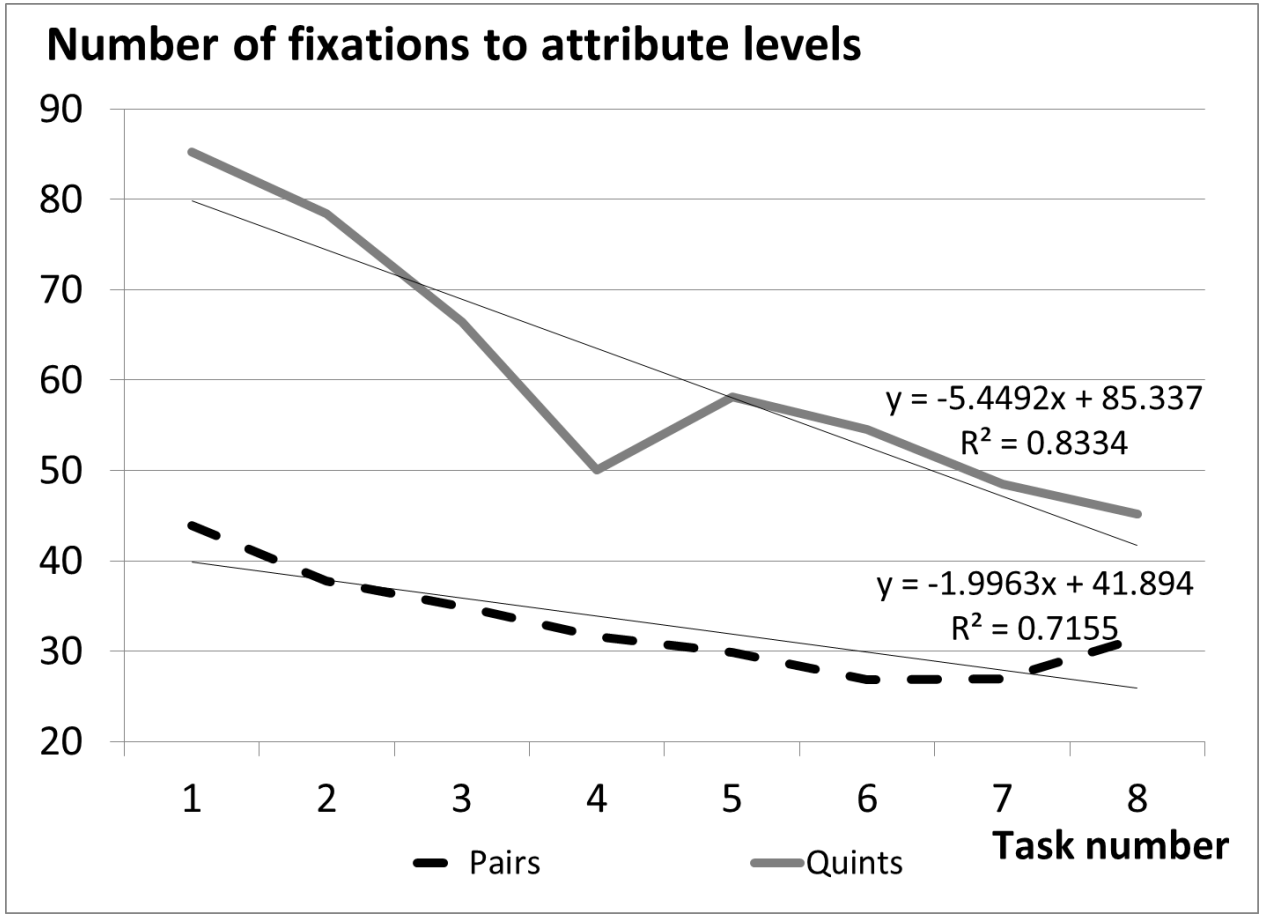
	Ave B std err	Variance	Effiency	Error given 174 pairs and 134 quints	
Pairs	0.093	0.0086	133.6	0.023	sqrt(.093/174)
Quints	0.082	0.0067	174.4	0.025	sqrt(.082/134)
ratio	1.134146341	1.28358209	1.305389222		

How similar are the partworths?



- Correlation of average partworths r=.92
- Pairs demonstrate greater nonlinearity in valuations within attributes
- Pairs elevate unimportant attributes: the standard deviation of importances is 20% less for pairs

Pairs need fewer fixations and show less improvement with experience



- Pairs average 33 fixations versus 61 for quints
- Pairs effort drops 22% with each doubling of experience, quints drop by 31%

Predictive performance: Pairs vs. Quints

Less Time:

Pairs 12.5 vs. quints 19.9 seconds

More consistent within task

78% internal hitrate for pairs, vs. 55% for quints

More consistent predicting holdout triples:

76% hitrate for pairs vs. 57% for quints

	Pairs	Quints
Pct. Cert.	.90	.69
RLH	.93	.60
Avg. Variance	6.8	2.8
Parameter RMS	4.1	2.2

Unexpected findings: Pairs

- Pairs, with 30% less efficiency generate better holdout predictions on triples
- Pairs demonstrate greater non-linear valuation
- Pairs, taking almost half the time, are perceived as more difficult

Unexpected findings: Quints

- Goal is to find an acceptable alternative
- Strong learning from experience occurs enabling greater focus on the important attributes and on the most promising alternative
- Greater focus on the item chosen
- Non-linear cutoffs may happen, but they are inconsistent across trials

Practical implications

- Pairs reflect the choices that would be made if all attributes are considered
- Pairs also are more efficient at assessing consumer reaction to changes in all attributes
- However, the practical difference between the two formats remains small

Large number of alternatives are justified when

- Task naturally involves multiple comparisons—such as selection from a store shelves
- The number of attributes is small—pricing study across close competitors
- Goal is to model consideration set—which showroom would one visit

Pairs are appropriate when

- Decisions are emotional—pairs facilitate tradeoffs between alternatives
- Decisions are difficult—Attributes are novel or require deep thought
- Decisions are important—thus justifying consideration of all attributes
- Decisions are complex—many attributes that are difficult to trade off