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IS MOTION MORE IMPORTANT THAN IT SOUNDS?: THE MEDIUM OF PRESENTATION IN ENVIRONMENT PERCEPTION RESEARCH

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Abstract

This study assessed the incremental validity of different media for representing landscapes with significant dynamic elements. The experimental design independently varied the presence of motion and sound in different representations of a wild and scenic river in order to evaluate the adequacy or sufficiency of the surrogate to reflect physical changes in the landscape. Three representational conditions were identified: (1) vidéo/sound, (2) video/no sound, and (3) static/no sound. A pilot study assessed the ability of the static images to represent river flow levels *per se*, and confirmed comparability with prior results (Brown & Daniel, 1989, *Journal of Environmental Psychology*, **7**, 233–250). Scenic beauty judgments were then collected within each representational condition. Multiple regression analyses were used to determine the relationship of flow level to perceived scenic beauty for each representation condition. The results demonstrated that motion and sound, individually and conjointly, influenced judgements of scenic beauty for a landscape with a significant dynamic element.

Introduction

A prevalent though unstated assumption throughout much of the empirical research in environmental preference is that the more closely experimental conditions represent 'real-life' experiences, the more accurately the results will reflect 'real-life' responses to the studied environment.[1] Consequently, environmental preference researchers, knowing that experimental conditions are not the same as real-life experiences, have periodically concentrated on issues concerning the validity and reliability of their methods (Daniel & Boster, 1976; Shuttleworth, 1980; Feimer, 1984; Brown & Daniel, 1987).

The validity of an assessment of environmental preference depends on many elements of experimental design. A number of authors (Craik, 1971; Bosselmann & Craik, 1987; Craik & Feimer, 1987) have organized these design elements into five general factors: (1) the characteristics of the observers, (2) the medium selected for presentation, (3) the response format, (4) the relevant environmental attributes of the settings, and (5) the nature of the transaction with the specific setting. Although each factor is equally important, this study focuses on only one—the medium of presentation.

The validity of the presentation medium generally depends on the adequacy, or sufficiency, of the medium to represent important elements of the environment for whatever task the subject is asked to perform. An issue pertinent to evaluating the adequacy of a presentation medium, infrequently investigated in environment perception research, is *incremental validity* (Sechrest, 1963), or 'to what extent adding an extra sensory channel to the simulator would increase the amount of information communication and enhance the predictive validity of the technique' (McKechnie, 1977, p. 172). The strategy behind assessing incremental validity begins with the minimum necessary and sufficient elements that need to be preserved in an environmental representation to ensure adequate validity, and then considers whether or not added environmental information enhances a representation's ability to predict responses to the actual environment.

Although prominent researchers (Ittelson, 1973; Wohlwill, 1976) have acknowledged that perception of the environment is, in principle, multi-modal, environmental preference research has consistently relied on uni-modal (*viz.*, visual) representations (Gifford & Fan Ng, 1982). Despite this uni-model approach, a number of researchers (e.g. Zube *et al.*, 1975; Daniel & Boster, 1976; Shuttleworth, 1980) have, for scenic beauty at least, reported high correlations between photo-based judgements and on-site judgements.

The utility of the previous representational validity research, however, may be limited to a relatively motionless environment, because the represented landscapes did not contain any prominently dynamic elements (e.g. a flowing river or waterfall). Thus, while previous research had demonstrated that static representations sufficiently preserve the relevant characteristics of relatively motionless landscapes for assessments of perceived scenic beauty, static representations of landscapes with dynamic elements have yet to be carefully investigated.

Dynamic Environment vs Dynamic Representation

Environmental preference research has not commonly distinguished between the movement of an observer through an environment and the movement of the environment *per se*. The former may be imitated by moving a video camera through an environment (i.e. a dynamic representation of a relatively static environment). The latter refers to the preservation of a dynamic element by the representation medium (i.e. a dynamic representation of a dynamic environment).

Motion pictures and video have been used to represent dynamic movement of the observer through static models of environments since the early 1970s (Craik & Feimer, 1987; Zube *et al.*, 1987), but empirical research involving dynamic representations of natural environments is limited. Banerjee (1977) used 16 mm color film to examine the scenic beauty of several coastal areas, Feimer (1984) used 16 mm color film to represent a nine-mile automobile tour through Marin County, California, and Ulrich and Simmons (1986) used video to represent various urban environments to investigate psychophysiological recovery from stressors. Recently, Vining and Orland (1989) compared static and dynamic representations of a residential landscape, and found considerable agreement between the two different representational media. In all of these examples, the represented landscape was relatively motionless or the presence of motion was not varied between conditions, and therefore could not be used to investigate the independent effect of a dynamic representation.

One study, Brown and Daniel (1991), employed a dynamic representational medium to represent a Wild and Scenic River (the Cache-la Poudre in Colorado) in order to investigate the effects of instream flow rates on visual preferences. Differences in flow rate, especially an inverted U-shaped curvilinear function (Figure 1), accounted for a significant proportion of the variation in estimates of perceived scenic beauty in the video representation. However, only results from a dynamic medium were reported, so the incremental effect of the addition of motion in the representation could not be assessed in relation to a static medium.

However, the initial experimental (Brown & Daniel, 1989) included a static representation condition—color slides. No relation, either linear or curvilinear, between visual preference and flow was significant ($a = 0{\cdot}05$) in the static representation condition (Figure 1). The data in the video condition, however, did indicate a significant ($p < 0{\cdot}05$) relation between SBE and flow level for both the simple and polynomial terms. In other words, the dynamic video representation of the river was able to incrementally capture variance in scenic beauty judgements lost in the static slide representation.

Although the results of Brown and Daniel (1989) clearly illustrated differences in scenic beauty judgements across static and dynamic representations, technical problems in the experimental procedures may have limited the generality of these results. Owing to personnel limitations, color slide and video representations could not be taken on the same day, allowing differences in lighting and weather conditions between the different representational media. Furthermore, framing, lens angle and photographic quality factors could not be precisely matched because of the different equipment and procedures used to capture the images over the 95 days required to sample the desired range of flow levels.

A controlled evaluation of the presence of motion

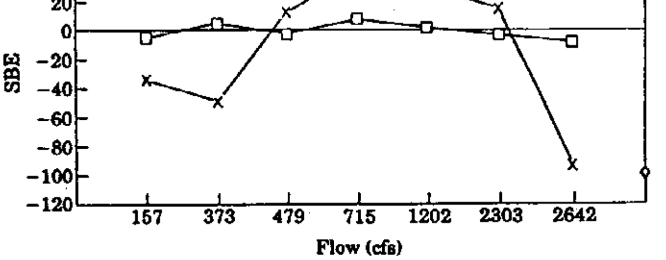


FIGURE 1. Relationship between flow and scenic beauty (Brown & Daniel, 1989). (–□–), Slide; (—×—), video.

of the Cache–La Poudre River. Three criteria were used to determine the photo points: (1) variety of view distance (e.g. near-view and vista), (2) representativeness of typical visitation patterns, and (3) absence of man-made structures. Photo points were marked to ensure that the exact same view was captured each time the photographer returned to the site. Since video footage was repetitively taken at the same photo point, we will refer to *view* as the landscape area being repetitively photographed and *level* as the measured in-steam flow rate (cfs or cubic feet per second) for a particular sample (static or video) of a view at a specific time. Thus, the stimuli sampled and presented to observers were individual *view/level* combinations (i.e. a particular landscape view at a particular in-stream flow level).

Each photo point yielded two views, as video recordings were taken looking (obliquely) both upstream and downstream from the point, for a total of up to 30 views. A representative range (from 2643 cfs to 152 cfs) of flow levels were recorded from 7 June to 9 September 1988. Video sequences were taken for 30 s on ¾" video film with a Sony DXC-1610 camera and Sony VO-3800 sound recorder. The 30-s video segments were later edited to 12 s and unwanted intrusions (e.g. views or sounds of automobiles, wind noise in microphones, etc.) were eliminated. Sequences exhibiting poor photographic quality (e.g. under or over exposures) that could not be repaired by editing were eliminated from the sample, resulting in a set of 220 view/levels representing 30 views with up to seven flow levels each. Figure 2 shows a typical view at low (157 cfs), medium (1105 cfs), and high (2642 cfs) flow levels.

Flow volume was estimated for each view/level in each condition at a U.S. Geological Survey gauge (no. 06752000), downstream of the inventory points. Flow estimates were adjusted for transfers, inflows from tributaries, and transbasin diversions to arrive at seven nominal flow levels.

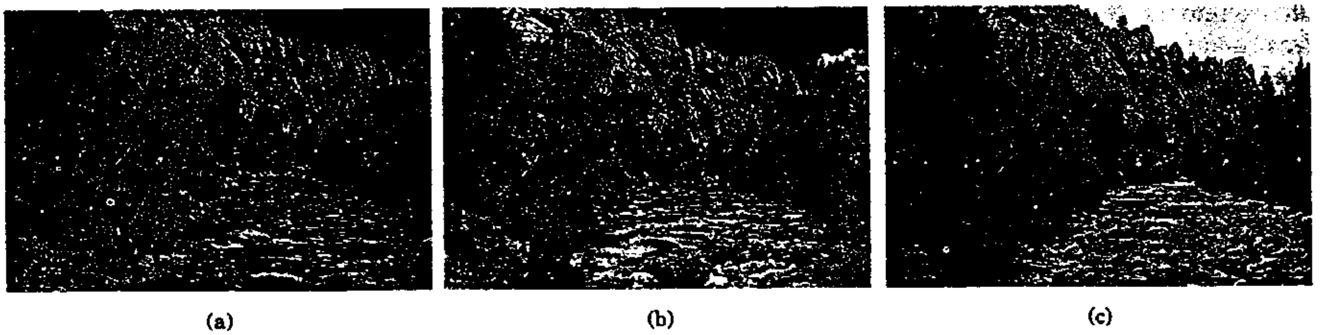
Design

To investigate the incremental effects of preserving the existing motion and sound of a dynamic landscape, scenic beauty judgments were obtained for three representational conditions, video/sound, video/no sound, and static/no sound. For the dynamic video conditions, the same video sequences previously described in Brown and Daniel (1991) were used with the presence or absence of sound varied at the monitor. For the static/no sound condition digitized single-frame images were captured from each video view/level using a TARGA 16 video image board and TIPS imaging software. This approach eliminated any unwanted variations between representational media (e.g. weather, framing, composition, color quality, and resolution).

It could be argued that neither the original color slides nor the captured digitized (static) images provide adequate representations of river flow levels—i.e. the lack of flow effects on scenic beauty for static slide presentations may be a result of a lack of adequate information about flow in the representation. Thus, a pilot experiment was designed to assess direct ratings of *flow level* for both color slides and digitized images on a subset of the original stimuli.

Pilot

In order to determine whether color slides and digitized images sufficiently (and similarly) represent flow levels, ten views were selected at random for each representational condition from the original set of stimuli (Brown & Daniel, 1989). Although the color slide flow rates did not always correspond exactly to the video flow rates (recall they were taken on different days), an effort was made to keep measured levels very similar within the five different flow-level categories studied (Table 1). The complete design matrix of the pilot study consisted



(a) (b) (c)

FIGURE 2. Representative sequences of flow levels Cache–La Poudre, Colorado, (a) 157 cfs, (b) 1202 cfs, (c) 2642 cfs.

in visual representations must satisfy at least three criteria: (1) a landscape with a significant dynamic element must be the subject of the representation, (2) the presentation of motion must be varied as an experimental condition for the *same* landscape, (3) the specific technical characteristics of representational media have to be controlled.

Sound

Environmental perception research has focused almost exclusively on the visual attributes of an environment (Gifford & Fan Ng, 1982), even though some researchers have acknowledged that 'Many sounds and smells in natural settings surely also influence our feelings' (Ulrich, 1983, p. 86). Quality research has been conducted regarding the sonic characteristics of an environment (Porteous, 1982; Porteous & Mastin, 1985). Such studies investigate the 'soundscape' or entire continuum of sound in an environment, and do not limit the investigation to a single aural element (e.g. noise). However, such research focuses exclusively on sonic qualities and does not present visual information in tandem. Therefore, the applicability and utility of this research is subject to the same limitations as the exclusive use of visual representations in preference research.

Although landscape preference research has occasionally included auditory stimulation (e.g. Brown & Daniel, 1991), the inclusion of the extra modality is generally not varied across conditions. In other words, sound is always presented in conjunction with the visual presentation,and therefore its contribution cannot be independently assessed. In the few instances that visual and auditory modalities have been investigated together (e.g. Gifford & Fan Ng, 1982), the represented environment was urban—not natural.

One study, Anderson *et al.* (1983), added sound to static representations of *both* urban and natural environments. When the sound of chirping birds was added to slides of a natural environment, preference ratings increased. When the sound of traffic was added to slides or urban environments, preference ratings decreased. When the sound was not directly associated with an element within the representation (e.g. hearing the chirping of birds without seeing the birds or bird habitat *or* hearing car horns without seeing cars or streets), the result was inconsistency in the subjects' preference ratings. The authors concluded that although appropriate sounds for either natural or urban environments had predictable results, inappropriate sounds led to confusion on the part of the observer as to the meaning of the information presented.

A controlled evaluation of the presence of sound in visual representations must vary the presentation of sound across different conditions in order to provide an estimate of the incremental effect of auditory information in the presentation medium. However, the sounds accompanying the visual representation must allow for a meaningful interpretation of the environment. To investigate the influence of sound, in other terms, the presence of sound needs to be varied for the same representational medium and the accompanying sound should not conflict with the visual information provided.

Method

The specific focus of the following research was to investigate the incremental benefits of the addition of motion and sound to a representation of a dynamic environment. A psychophysical approach was adopted to assess the effects of different representational media on observers' ratings of scenic beauty. The presence of *both* motion and sound were varied across different representations of the same landscape under more controlled conditions than Brown and Daniel (1989). The study landscape, the Cache–La Poudre River in Colorado, was selected because of previously identified physical variables (*viz.*, instream flow levels), known scenic beauty values, and a viability of stimuli (Brown & Daniel, 1991).

The experimental approach began by identifying the categories of a 2 by 2 design varying the presence of motion and sound, thereby producing four different conditions. During a pre-test of these four conditions, however, subjects expressed confusion regarding the nature of the task in the *static image/sound* condition. Because previous research (e.g. Anderson *et al.*, 1983) had also documented numerous problems with the presentation of inconsistent stimuli, the static representation of a river with the sound of rushing water was eliminated as not being ecologically valid or interpretable. Hence, three representational conditions were retained to investigate the effects of sound and motion: (1) *video/sound*, (2) *video/no sound*, and (3) *static/no sound*.

Stimuli

In Brown and Daniel (1991), 15 points were selected along a 40-mile designated wild and scenic stretch

TABLE 1
Comparable flow levels across conditions for pilot experiment

Level	CFS*	
	Video	Slides
1	157	152
2	373	373
3	1202	1105
4	1975	1763
5	2303	2304

* Cubic feet per second.

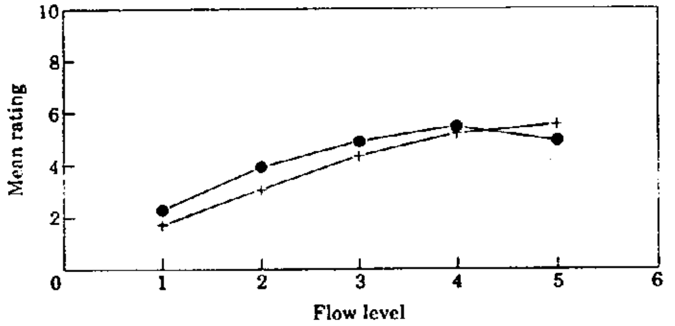


FIGURE 3. Mean ratings of flow level by condition, pilot study. (-●-), Digitized image; (-+-), slides.

of ten views across five flow-level categories yielding 50 view/levels (scenes) in each condition.

Subjects in each of the two conditions viewed and rated the 50 view/levels in a predetermined random order. Subjects were nested within condition, such that no one subject rated view/levels in both conditions. Subjects were instructed to rate the *flow level* of the river for each view/level on a 10-point scale, where a rating of 1 indicated a very low flow level and a 10 indicated a very high flow level. The instructions stressed that the rating was for the *amount of water* in the stream bed (not the quality of the scene). To establish rating scale anchors subjects previewed ten view/levels randomly selected from the remainder of the stimuli, which depicted a full range of the five flow levels. The preview view/levels for the pilot rating session were shown for five seconds each, and the rated view/levels were shown for eight seconds each.

A total of 26 subjects, ten in the digitized image condition and 16 in the color slide condition, were used in the pilot study. All subjects were enrolled in introductory psychology classes at the University of Arizona, and each student received credit toward a research requirement for participation in this study.

Subjects' ratings were averaged across the five flow-level categories within each presentation condition. The group-to-group correlation, an indicator of the mean correlation between the experimental sample and any other sample drawn from the same population (Ebel, 1951), for the color slide condition was $r = 0{\cdot}95$ and for the digitized image condition was $r = 0{\cdot}84$. The coefficients indicated substantial reliability among observer groups for ratings of flow level.

Ratings of flow were averaged across flow-level within each condition, and are presented graphically in Figure 3. The slope functions for both digitized images and color slides have clear linear upward trends, with a slight drop in the digitized image condition at the highest flow level. The correlation between the ratings of these two representations was $r = 0{\cdot}95$, indicating considerable agreement between ratings of flow in either condition. Furthermore, the relationship between measured flow levels and subjects ratings of flow was substantial ($F_4 = 196{\cdot}49$, $p < 0{\cdot}05$). These results confirm that both digitized (static) images and color slides preserve sufficient information regarding flow level to support direct perceptual judgments of flow. Furthermore, digitized images appear to represent river flow levels as well as color slides with the advantage that unwanted variation between static and dynamic presentational media are eliminated.

Main experiment

Video (dynamic) conditions. Twenty of the 220 view/level combinations were randomly selected for a baseline, a common set of scenes to be rated by all observers. The remaining view/levels were randomly sorted into three unique sets of 66 to 67 scenes each (see Table 2). Any given set rarely included more than three levels (i.e. flow levels) for the same view. The 20 baseline view/levels were added to the unique sets. Baseline view/levels were arranged in a random order and placed in every fourth position, beginning with the fourth position, to ensure that different levels of the same view were spread out among levels from other views.

Since significant differences did not emerge across the different random orders in Brown and Daniel (1989, 1991), only a single random order was used in each set of view/levels. Thus, three observer groups were required per condition for a total of nine observer groups. The river view/levels in both video conditions were displayed on a 25" Sony Trinitron color video monitor (PVM-2530), using a commercial high quality four-head videotape player. Presence or absence of sound was controlled by connecting (or disconnecting) the speakers, as appropriate to the representation condition.

TABLE 2
Number of subjects and view/levels judged for main experiment

	Video/sound condition		Video/no sound condition		Static/no sound condition	
	View/levels	Subjects	View/levels	Subjects	View/levels	Subjects
Baseline	20		20		20	
Set 1	67	33	67	30	67	60
Set 2	67	34	67	21	67	58
Set 3	66	36	66	27	67	40
Total	220	103	220	78	220	158

Static no sound condition. The same view/levels previously described were captured as static single-frame digitized images and presented in the same view/level sets as the video/sound and video/no sound conditions. The digitization process translates a video image onto a 512 × 400 pixel matrix. Color is preserved in the digitized image with up to 32,768 color levels, although some clarity is lost in the translation from a video image to a digitized image (Orland, 1986; Vining & Orland, 1989). The view/levels in the static/no sound condition were displayed in the same random orders and on the same monitor as in the video conditions using a digital image presentation software package (TRUEVISION).

Procedure

The procedure for all three conditions was the same. After being read the instructions by the experimenter, subjects viewed 20 preview view/levels, randomly selected within each condition, that depicted the full range of flow levels and types of views that were to be rated. Preview view/levels were shown for five seconds each.

Observers were then instructed to rate the *scenic beauty* of the area depicted by each view/level on a 10-point scale, where a rating of 1 indicated very low scenic beauty and 10 indicated very high scenic beauty. Subjects were also asked to use the full range of the 10-point scale in order to compare the scenic quality of one area to another. The view/levels for the video conditions and the static/no sound condition were shown for 12 s each.

For all conditions, subjects' ratings for each randomized order were adjusted for presentation order, and then scaled using the program RMRATE (Brown *et al.*, 1990) to produce Scenic Beauty Estimates (SBEs) for each view/level. This scaling procedure translates raw ratings into a standardized interval scale index in order to control for variations in an individual's use of the arbitrary 10-point scenic beauty rating scale. The origin of the SBE scale is defined by the baseline view/levels common to each of the random order presentation sets.

Subjects

Observers were randomly assigned to and nested within each condition, such that no one subject rated more than one view/level set or presentation condition (medium). Observers were enrolled in introductory psychology classes at the University of Arizona, and each student received experimental credit toward a class requirement for participation. A total of 103 observers were run in the video/sound condition, 78 in the video/no sound condition, and 158 in the static/no sound condition. (See Table 2 for a complete listing.) In all, 339 subjects rated the river view/levels.

Results and Discussion

Reliabilities

Group-to-group reliabilities for the nine subject groups (three conditions by three view/levels sets) were all quite high, ranging from 0·79 to 0·95 (Table 3). The group-to-group correlation is an indicator of the mean correlation between the experimental sample and any other sample of the same size drawn from the same population (Ebel, 1951). The coefficients were consistent across both view/level sets and conditions, indicating substantial agreement with any other group drawn from

TABLE 3
Group-to-group reliabilities of observer ratings in main experiment

Scene set	Video/sound condition	Video/no sound condition	Static/no sound condition
1	0·86	0·88	0·91
2	0·88	0·79	0·92
3	0·95	0·87	0·95

the same population. In addition, the group-to-group correlations reported in the present study are very similar to those reported by Brown and Daniel (1989, 1991).

A indicator of the degree to which the different observer groups agreed about the relative scenic beauty of the view/levels is the correlation between the common baseline view/levels within each presentation condition. This reliability coefficient represents the consistency of SBE ratings for the 20 baseline view/levels among the three groups within each condition. These correlations ranged between 0·58 and 0·81 (Table 4), with a median of 0·68, and were similar to those reported by Brown and Daniel (1991).

Scenic beauty estimates

The relation of flow to scenic beauty was assessed by regressing the SBE values on the flow level measures across all view/levels within each representation condition. Since the best predictor of scenic beauty in the video condition of Brown and Daniel (1989, 1991) was the squared term of flow, flow level was entered into the regression equation as both a simple and squared term. The resulting regression equations for the video/sound, video/no sound, and static/no sound conditions are presented in Table 5.

The data in all three conditions indicate a significant relation of SBE to flow for both the simple and polynomial terms. However the adjusted-R^2 values for each condition vary significantly between conditions, with the video/sound condition highest (0·28), the video/no sound condition moderate (0·18),

TABLE 4
Baseline (n = 20) correlations among groups within video conditions and static/no sound condition

	1	2	3
Video/sound condition			
1	1·0		
2	0·68	1·0	
3	0·65	0·80	1·0
Video/no sound condition			
1	1·0		
2	0·64	1·0	
3	0·58	0·81	1·0
Static/no sound condition			
1	1·0		
2	0·63	1·0	
3	0·80	0·77	1·0

TABLE 5
Regression estimates for video/sound, video/no sound and static/no sound conditions

Variable	Video/sound condition	Video/no sound condition	Static/no sound condition
Constant	−91·08	−45·89	−28·56
	(−7·24)	(−6·61)	(−4·10)
Flow	0·21	0·09	0·05
	(8·11)	(6·38)	(3·41)
Flow^2	−7·76 E−5	−3·10 E−5	−1·62 E−5
	(−8·49)	(−6·20)	(−3·24)
R^2	0·28	0·18	0·10
F	36·75	20·41	10·58

* Numbers in parentheses are Student's *t*-ratios (all $p < 0{\cdot}05$).

and the static/no sound condition lowest (0·10). Since the adjusted-R^2 is an indicator of the amount of variance in SBEs explained by the variance of the simple and polynomial terms of flow level, the differences in the sufficiency of the presentational media to represent the relationship between flow and scenic beauty are evident.

The SBEs for each stimulus were averaged across all views within each flow level within each condition. The results of this procedure are displayed graphically in Figure 4, and provide a convenient index of the effect of flow on scenic beauty. Based on the earlier study of Brown and Daniel (1991), the flow function of the video conditions was expected to be polynomial, with the SBEs peaking between 1100 and 2300 cfs. In comparing the two figures, the function of the video/sound condition in the present experiment is very similar to the polynomial function of the video condition reported in the previous study.

The video/no sound and static/no sound conditions, however, appear to be more linear than polynomial functions. For both of these two conditions, the relative contribution of the simple flow term is

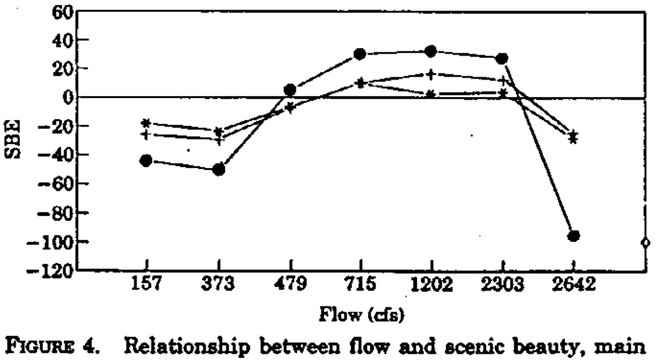


FIGURE 4. Relationship between flow and scenic beauty, main experiment. (–●–), Video/sound; (–+–), video/no sound; (–✕–), static/no sound.

greater than that of the polynomial flow term (Table 5). This is a rather interesting result, in that it seems that the video conditions, which preserved the motion of the river, should be more similar in form with each other rather than with the static condition. In addition, it should be noted that the video/sound condition in this study was a direct replication of the video condition in Brown and Daniel (1989, 1991) and produced markedly similar results (r = 0·98) to the prior experiment. Hence, the polynomial function between flow and perceived scenic beauty should be considered robust, and not the result of some unknown intervening variable. The video/no sound condition produced a similar, although attenuated, function when compared with the video/sound polynomial function. The static/no sound condition, which lacked information regarding both motion and sound, produced the least responsive function to flow.

In explaining the incremental progression from the static/no sound condition to the video/sound condition, it was hypothesized that the presence of sound possibly drew attention to the motion in the video/sound representation by making motion more salient to the observer. Consistent with this hypothesis, the ratings of the video/no sound condition fell between the two extremes. Motion produced some differences in perceived scenic beauty between in-stream flow levels, but the relationship was severely diminished. Without information pertaining to both motion and sound in a dynamic landscape, the underlying relationship between perceived scenic beauty and in-stream flow levels would not have been discovered.

Conclusions

The intent of this research was to investigate the incremental validity of representational surrogates of dynamic environments. Photographs have been shown to be valid surrogates for relatively static environments. However, Brown and Daniel (1989, 1991) found systematic differences between static and dynamic representations for a dynamic environment. They concluded that the static surrogate (*viz.*, color slides) did not sufficiently preserve dynamic environmental features, while the dynamic surrogate (*viz.*, video) produced flow-related differences in ratings of scenic beauty.

In this experiment, the pilot study demonstrated that when observers are instructed to attend to flow level, reliable ratings of the physical variable can be obtained across color slides and digitized images. In the main experiment, we controlled for the technical differences between representational media in order to obtain a better estimate of the ability of a surrogate to reproduce important environmental information.

Although motion was emphasized by Brown and Daniel (1989, 1991) to be the modality which supported the observed relationship between perceived scenic beauty and flow level, the results reported here indicate that *both* sound and motion influence judgments of scenic beauty. Motion without sound produces similar results to the static digitized image condition, while the motion with sound and the original video results suggested a consistent polynomial relationship between perceived scenic beauty and flow.

The results presented here discourage the *de facto* acceptance of either static or dynamic surrogates to represent environmental stimuli without consideration of the type of information required of an observer to make consistent ratings. Before selection of an environmental surrogate to represent landscapes, researchers need to evaluate whether or not the addition of different environmental information would enhance the representation's ability to predict responses to the actual environment better.

The purpose of this experiment was to investigate the incremental addition of environmental information to the standard representation format in environment perception research: the static slide. If systematic differences in responses occur because of the media of representation, then, as shown here, environment perception researchers should endeavor to discover what other important environmental attributes may have been overlooked because they were not adequately captured by the representation medium used as a surrogate for the environment under investigation.

Note

(1) We refer to this as an assumption, rather than fact, simply because the statement can never be tested. Although many experiments concerning the validity of landscape preference methods compare experimental conditions with *in situ* conditions, we recognize that even on-site assessments rely on a particular presentation of the environment, response measure, and experimental context that may differ from normal experience of the landscape.

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