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Preschool Children Recognize the Utility of Differently Shaped Trees: A Cross-Cultural Evaluation of Aesthetics and Risk Perception

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The examination of children's perception of tree shapes was guided by two evolutionary hypotheses: 1) the savanna hypothesis that aesthetic preferences for specific tree shapes are innately biased by what information is afforded on habitat quality, and 2) evidence of sex differences in the arboreal behaviors of preschool children that reflects the evolutionary persistence of sexual dimorphism in Pliocene hominids. In Study 1, 3 to 5 year-old Japanese, Israeli, and American children were shown 4 distinctive tree silhouettes (Australian Pine, African Fever Tree, unbrowsed and browsed African Umbrella Thorns); children were requested to select the prettiest tree and the tree to climb to see better, to hide in, to sleep in, and to feel safe from a lion. For Study 2, 3 to 4 year-old American children were asked these questions and questions about climbing difficulty and shade. Children engaged in simulated tree climbing with their fingers to seek refuge from the lion. Log-linear analyses revealed no major cultural differences in the choice of the prettiest tree, the tree to sleep in, and the tree to feel safe from the lion; there were no sex differences in tree choice for any question. In the second study, girls were more cognizant of crown shapes than boys as evinced by their choice of refuge sites closer to crown edges in trees with the widest crowns, a tactic taken by savanna baboons to evade leopards. Predominant choice of the Australian Pine as the prettiest tree does not support the savanna hypothesis for innate aesthetic preferences. The greater choice of girls for refuge sites nearer to crown edges supports the evolutionary persistence model for historical sexual dimorphism spanning 2 million years of relaxed selection.

The classification of tree attributes has become increasingly important as a method for selecting appropriate street trees for residential and commercial areas (Sommer, Guenther, & Cecchetti, 1992; Sommer, Summit, & Clements, 1993). In urban and recreational settings, the study of tree configurations, especially crown structure, is relevant to energy conservation (McPherson & Rowntree, 1993) and for characterizing the scenic quality of landscaped parks and gardens (e.g., Schroeder, 1986).

For the most part, research on environmental perception has concentrated on developing instruments for assessing environmental attributes and aesthetic preferences that could affect landscape planning (reviewed by Schauman, 1988). Emphasis on examining aesthetic preferences, however, has been critiqued for its ahistorical view and its failure to address how contextual phrasing affects perceiver aesthetic evaluations (cf. Carlson, 1977; Ribe, 1986; Turner, 1985).

A critical shortcoming of landscape preference research is the lack of focus on human-environment relationships that reflect the dynamic aspects of how the environment is perceived and how such perception affects ensuing behavior. Gibson (1986) proposed the concept of *affordances* to describe what the environment *means* to perceiving organisms and how this meaning is related to what the environment

offers. From the percipient's point of view, recognition of meaningful organism-environment relationships provides the perceived *context* for organizing appropriate behavior that further adjusts these relationships.

Historical factors in both life history and phylogenetic domains play essential roles in how organisms perceive their environments in the immediate time frame. The perceptual systems of organisms have long evolutionary histories manifested by highly conserved functional properties. These properties include the ability to recognize ecologically important habitat features, such as former predators that were once present in the historical environment (Coss, 1991; Curio, 1993). Such innate pattern-recognition abilities can persist for thousands of generations of relaxed natural selection (reviewed by Coss & Goldthwaite, in press). The evolutionary persistence of pattern-recognition abilities in a variety of vertebrates provides an empirical context for evaluating whether humans retain perceptual biases shaped by natural selection that affect aesthetic preferences and guide artistic and design-related problem solving (see Coss, 1968).

The development of a more explicit theoretical model of habitat preferences has been hampered by the lack of criteria for evaluating ecologically important variables. Orians (1980, 1986) has posited the "savannah hypothesis" to predict what features would make one landscape more attractive than another. In further development of the aesthetic aspects of this hypothesis, Orians (1986) describes a hierarchical structure for habitat choice in which the lowest level involves responses to specific attributes that attract attention and are mildly arousing, such as trees that characterize important habitat qualities that include the presence of water. In keeping with this construct, cross-cultural research on tree preferences conducted in Argentina, Australia, and Seattle, Washington, (Orians and Heerwagen, 1992, p. 559) yielded the following results:

The trees rated as most attractive by all three groups are those in which canopies are moderately dense and trunks bifurcate near the ground. Trees with high trunks and skimpy or very dense canopies are judged as least attractive by all three groups.

In addition to identifying those features that reflect habitat quality, another facet of this thrust to develop appropriate criteria for evaluating landscape preferences involves various issues of risk assessment. Kaplan (1972, 1987) has argued that the "hardship and danger" faced by our human ancestors might be expressed today in the way environmental information is gathered and processed. In further development of this idea, Woodcock (1982), integrated Appleton's (1975) evolutionary view of the adaptive value of identifying habitat prospects with that of Gibsonian affordances as a heuristic for evaluating habitat preferences. Woodcock found that women rated pictures of hardwood forests and savanna scenes somewhat differently from that of males, a result he interpreted as reflecting historical differences in the hunter-gathering roles of men and women. In particular, the women had lower preferences than males for landscape settings, such as open savanna, in which they were exposed and potentially vulnerable.

The identification of sex differences in spatial abilities is becoming increasingly important for evaluating hormonal influences on brain development (see Kimura, 1992). However, scant attention has been paid to fossil evidence suggesting that male and female Pliocene hominids differed considerably in their use of terrestrial and arboreal habitats in ways that might persist today as evolutionary biases in habitat perception. Throughout the Miocene of Africa, trees provided hominoids with consistent sources of edible fruits, shade, and refuge from predators. With the appearance of bipedal locomotion in hominids during the middle Pliocene, congruent with drier climatic conditions in East Africa (Bonnefille, 1984), the utility of trees as shady places was likely enhanced, and trees retained their utility as nighttime refuge sites from predators. Differences in crown width and height and distinctive branch configurations would have been available as important perceptual cues as landmarks and as refuge sites useful for organizing terrestrial foraging activities. The larger body size and less flexible ankle joints of adult males is thought to have precluded facile tree climbing for nighttime refuge whereas females were less constrained in seeking refuge because they retained pongid-like morphological adaptations for climbing. With reference to Pliocene hominids in East Africa, Susman, Stern, & Jungers (1984, p. 149) conclude that:

"there is extraordinary sexual dimorphism at Hadar, and that the sexes partitioned their time between the trees and ground differently. The heavy males spent less time in the trees than did females...We will stand by our previous choice of sexual dimorphism coupled with sexual dimorphism."

Further climatic warming with loss of trees apparently prompted the evolution of longer hindlimbs for more efficient bipedalism and nearly exclusive terrestrial foraging. As suggested by the fossil evidence for *Homo erectus* dispersal from Africa to Asia prior to 1.8 million years ago (Swisher et al., 1994), reduction in sexual dimorphism characterized by hindlimb elongation sets the evolutionary time scale for prolonged relaxed selection on using trees as nighttime refuge sites. If natural selection had indeed shaped the perceptual assessment of tree affordances prior to this terrestrial advancement in *Homo* and, considering the slow rate of hominid evolution (see Li et al., 1990; Seino, Bell, & Li, 1992), it is conceivable that humans today retain perceptual relics of what trees afford in certain dangerous contexts. Such evolutionary persistence, spanning a 2 million year time frame of relaxed selection, would clearly exceed that known for rodent antipredator behavior under analogous conditions of prolonged relaxed selection (see Coss, 1991).

The current research on tree perception was guided by previous evidence showing significant sex differences in perceptual, cognitive, and motoric behaviors of young children (Coss & Goldthwaite, in press). Girls were found to engage in arboreally related behaviors more than boys and differed in the spatial aspects of their nighttime fears. For example, girls exhibited a propensity to climb playground equipment more than boys, receiving fewer falling injuries. A greater proportion of girls adopted a rope-walking posture while traversing a balance beam, holding their arms out to stabilize their center of mass. The strongest

cognitive evidence for the evolutionary persistence of sexual dimorphism in arboreal habitat use for refuge is reflected by the comments of preschool girls who report in much greater frequency than boys the presence of "scary things" lurking under their beds at night.

Study 1: Cross-cultural Comparisons

In Study 1, we examined children from three cultures to assess their aesthetic preference for specific tree shapes and how these tree shapes affect their choice for climbing in different contexts. Virtually no experimental research has been conducted on children's tree-climbing activities, in part because of ethical concerns for initiating behaviors that could endanger young children. Outside of direct observation, information on tree-climbing experiences for specific age groups can be inferred indirectly from the frequency of acute climbing injuries requiring treatment in hospital emergency rooms. Analyses of the U.S. Product Safety Commission NEISS database revealed that the rate of falling from jungle gyms and monkey bars accelerates markedly between 3 and 5 years of age, peaking at age 6 (Coss & Goldthwaite, in press). This information was used to restrict the age range to 3 to 5 years for sampling children's attitudes about trees.

Method

Subjects. Three groups of children were interviewed in day care settings in Davis, California ($n = 41$), Haifa, Israel ($n = 38$), and Tokyo, Japan ($n = 39$). Sex and age were approximately balanced.

Tree silhouettes. Four tree silhouettes were selected for study. Silhouettes were traced from projected 35-mm slides of the following trees photographed in the field: 1) Australian Pine (*Pinus nigra*), a common ornamental tree in Davis; 2) Fever Tree (*Acacia xanthophloea*) from the Amboseli National Park, Kenya; 3) unbrowsed Umbrella Thorn (*Acacia tortilis*) from the Amboseli National Park; 4) heavily browsed Umbrella Thorn from the Serengeti National Park, Tanzania. Trees were photocopied from India ink drawings and arranged in a rectangular presentation for children to compare (see Fig. 1); their respective heights and widths in scale were: 1) Australian Pine, 91 by 36 mm; 2) Fever Tree, 93 by 80 mm; 3) unbrowsed Umbrella Thorn, 54 by 108 mm; and 4) browsed Umbrella Thorn, 49 mm by 98 mm. Such silhouette sizes permitted children to compare bole, branch, and crown configurations as well as climb them with their fingers (see Study 2).

Insert Fig. 1 about here

Procedure. Children in each cultural group were interviewed in their native language apart from other children by one female interviewer familiar with the children. Children were seated at a table and shown the page with four tree silhouettes. The interviewer sat adjacent or across from the subject depending on table configuration. To set the stage for questions about what trees afford, the children were asked if they climbed trees, how often they climbed trees, and where they climbed

trees. This introduction was followed by four questions in random order: "Which tree is the prettiest? Which tree would you climb to see better? Which tree would you choose to sleep in? Which tree would you climb to hide?" The final and most provocative question involved refuge from predation: "A wild lion has escaped from the Zoo and was seen nearby. Which tree would you climb to feel safe?" Children were requested to point to the tree of their choice and any comments were noted for each question.

Results

Contingency tables were examined using a two-factor (trees and cultures) log-linear model which contrasted the overall frequencies of tree choice and the interaction of tree choice and culture. Pearson Chi-square tests (maximum likelihood model) yielded the following results.

For all children, the major effect for differences in the choice of the prettiest tree was statistically significant, $X^2(3) = 49.14$, $p < .001$, with half of the children selecting the Australian Pine. Within each cultural group, the majority of American and Israeli children (59% and 53%, respectively) preferred the Australian Pine compared with 39% of Japanese children (see Fig. 2A). The tree by culture interaction was not significant. The major effect for choice of trees for climbing to see better was significant, $X^2(3) = 14.10$, $p < .005$. The Fever Tree providing both height and less foliage to obstruct viewing was selected by 36% of all children, contrasted by 14% of children who selected the densely foliated unbrowsed Umbrella Thorn. However, tree choice was less consistent across cultures as manifested by a significant culture by tree interaction, $X^2(6) = 17.24$, $p < .01$ (Fig. 2B). Thick foliage providing obscuration biased the choice of half of the children who selected the unbrowsed Umbrella Thorn as the best tree for hiding, $X^2(3) = 44.34$, $p < .001$; yet, cultural differences in the choice of alternative trees, especially the browsed Umbrella Thorn yielded a significant culture by tree interaction effect, $X^2(6) = 17.58$, $p < .01$ (Fig. 2C). Cultural differences were less apparent for the choice of trees to sleep in and for climbing to feel safe from the lion. In both sleeping and antipredator contexts, the unbrowsed Umbrella Thorn was chosen by the greatest percentage of children (48% and 43%, respectively). The Australian Pine and browsed Umbrella Thorn were selected by much smaller proportions of children (compare Figs. 2D and 2E), yielding significant major effects for tree choice for sleeping and safety, respectively: $X^2(3) = 35.25$ and 31.54 , $p < .001$.

Insert Fig. 2 about here

Study 2: Influence of Historical Sexual Dimorphism

The objective of the second study was to examine sex differences in tree choice in an enlarged 11-item survey that included the selection of roosting sites in simulated tree climbing. Based on previous research (Coss & Goldthwaite, in press) on children's climbing, balancing, and nighttime fears, suggesting that modern humans retain 2 million year-old

cognitive and motoric relics of hominid sexual dimorphism (see Susman, Stern, & Junger, 1984), it was hypothesized that to escape the lion, girls would choose roosting sites nearer to the crown edge than boys. This prediction was based on observations that Chacma baboons (*Papio ursinus*) in Botswana select roosting sites in sleeping trees on thinner branches nearer to crown edges than on thicker branches nearer to the crown midline that are less likely to support the heavier weight (~91 kg) of attacking leopards (William J. Hamilton III, pers. comm., 1978). In further development of this hypothesis, the body weights of *Australopithecus afarensis* and *Homo habilis* are estimated to have been 29-32 kg for females and 45-52 kg for males, which for females approximate the weights of large male baboons (cf. McHenry, 1992a,b; Napier & Napier, 1967). Like Chacma baboons that currently exploit the safety afforded by the reduced weight-bearing properties of thin branches near crown edges, adult female hominids might have been similarly inclined to select roosting sites on thin branches to escape leopard predation.

Subjects. One hundred twelve 3 to 4 year-old preschool children (49 males and 63 females) were interviewed about their tree choices at nine day-care centers in Davis, California. Sample sizes for questions varied from 110 to 112 children because not all children answered all the questions. Twelve 3 to 4 year-old Davis children from Study 1 were asked to select roosting sites in simulated tree climbing during protocol development for Study 2, yielding altogether 30 girls and 18 boys for the 3 year-old age group and 37 girls and 36 boys for the 4 year-old age group.

Tree silhouettes. To avoid any bias in tree choice due to graphical layout, the four tree silhouettes were presented as in Study 1 (see Fig. 1) and repositioned clockwise in a second layout so that the Australian Pine appeared in the lower right corner of the page.

Procedure. Children were interviewed by one male and fifteen female investigators. Two questions were added to the 5-item interview protocol used in Study 1 that probed children's recognition of tree configurations perceived as the most difficult to climb and afford the best shade: "Which tree would be the most difficult to climb? Which tree would you stay under to keep cool on a hot day?" The order of the first 6 questions was randomized before asking the provocative question about which tree affords safety from the lion. Four additional questions examined how children climbed trees after they selected the safest tree. Each child was asked the following: "Where in that tree would you climb to feel safe?" The interviewer marked the spot on the silhouette where the child's finger touched the paper after the child pointed or stopped moving his or her finger after tracing a climbing route on the silhouette. This question was repeated for the three remaining trees and prompted by the interviewer circling to the next tree to be climbed with her palm, the order of which varied across subjects.

Results

Contingency tables of tree choice for each question were analyzed by two-factor (trees and sex) log-linear analyses using Pearson Chi-square tests. None of the tree by sex interactions were statistically significant, indicating no major sex differences in tree choice. For both sexes combined, the major effect of tree choice was significant for all questions except the choice of tree to climb to see better. As in the first study, half of the children selected the Australian Pine as the prettiest tree; the Fever Tree was chosen by the smallest proportion of children (5%), yielding altogether a strong major effect for tree choice, $X^2(3) = 47.84$, $p < .001$ (Fig. 3A). Again, the thick foliage of the unbrowsed Umbrella Thorn engendered its predominant choice for hiding (58%) and sleeping (44%), with major effects for tree choices, $X^2(3) = 66.64$ and 31.50 , $p < .001$, respectively (see Figs. 3C,D). The unbrowsed Umbrella Thorn was also the predominant choice (63%) for staying under to keep cool, engendering a highly significant major effect for tree choice, $X^2(3) = 88.42$, $p < .001$ (Fig. 3F). The Fever Tree was selected by the largest proportion (38%) of children as the most difficult tree to climb (Fig. 3E), whereas the browsed Umbrella Thorn with branches forking near the ground was selected as the most difficult by the smallest proportion (16%) of children (major effect for tree choice, $X^2(3) = 13.50$, $p < .005$). Congruent with the choice of tree for hiding and sleeping, the unbrowsed Umbrella Thorn was the predominant choice of children (40%) to feel safe from the lion. In contrast, the browsed Umbrella Thorn which afforded little concealment was selected by the smallest proportion (13%) of children for refuge from the lion, yielding the following major effect for tree choice: $X^2(3) = 19.54$, $p < .001$ (Fig. 4A).

For the questions of where in the trees would the children feel safe, roosting sites marked in the tree silhouettes were measured by a millimeter ruler for vertical height from the ground and lateral deviation from the crown midline. Because the tactics taken by children to escape the lion might be correlated among the tree configurations, vertical and lateral measurements were examined separately by multivariate analyses of variance (MANOVAs). These vertical and lateral measurements were examined separately as dependent variables from each tree. Two-factor (age and sex) MANOVAs, followed by tests of simple effects revealed that 3 and 4 year-old girls differed significantly in their choice of vertical roosting sites: multivariate $F(4,114) = 2.447$, $p < .05$. As derived from two-factor analyses of variance (ANOVAs), the source of this difference is apparent for each tree (Fig. 4B) because the 3 year-old girls were more reticent to climb as high as the 4 year-old girls (simple effects $F(1,114)$ range = 3.991 to 6.938, $p < .05$). The MANOVA for lateral roosting sites indicated a significant main effect for sex, but not age (multivariate $F(4,114) = 2.487$, $p < .05$). Follow-up ANOVAs coupled with tests of simple effects for sex differences for each age group showed that the main effect for sex was significant for only the unbrowsed Umbrella Thorn, $F(1,117) = 9.635$, $p < .005$. For both age groups, the girls selected roosting sites significantly farther from the crown midline than roosting sites selected by the boys [3 year-olds: $F(1,117) = 5.775$, 4

year-olds: $F(1,117) = 3.864, p < .05$]. The girls from both age groups selected roosting sites in the Fever Tree and browsed Umbrella Thorn farther from the midline than those selected by the boys, but sex differences were significant only for 4 year-old children in their choice of roosting sites in the unbrowsed Umbrella Thorn, $F(1,117) = 4.832, p < .05$ (Fig. 4C).

Sex differences in tree climbing were also analyzed using discriminant function and classification analyses to examine whether boys and girls were consistent in their selection of lateral roosting sites. The discriminant function for the four trees indicated a significant sex difference (multivariate $F(4,116) = 2.527, p < .05$) with the canonical variate correlations of the unbrowsed Umbrella Thorn (-.951), browsed Umbrella Thorn (-.527), Fever Tree (-.267), and Australian Pine (-.049) providing an index of their contribution to separating boys from girls. Follow-up classification analysis revealed that 39 of 54 boys (72%) were correctly classified as boys based on their selection of lateral roosting sites near the midline of the four trees. The majority of the girls also selected roosting sites in keeping with those of boys, and only 28 of 64 girls (42%) were correctly classified as girls.

Insert Figs. 3 and 4 about here

Discussion

The results of the first study using tree silhouettes to examine how American, Israeli, and Japanese children perceived the affordances of differently shaped trees indicated no major cultural differences in the frequency distributions of choice of the prettiest tree, the tree to sleep in, and the tree to feel safe from a lion. Significant cultural differences did emerge in the choice of tree to climb to see better and to climb to hide, the results of which are difficult to interpret as a product of cultural variation in childhood experiences.

The focus on sex differences in the second study was based on the hypothesis that modern humans retain perceptual, cognitive, and motoric relics of hominid sexual dimorphism under relaxed selection for the past 2 million years (Coss & Goldthwaite, in press). Based on fossil evidence for sex differences in body size and tree climbing agility, Pliocene females are hypothesized to have spent more time in trees than males (Susman, Stern, & Jungers, 1984); any evolutionary persistence of sex differences in the perception of what trees afford might be manifested in the preferences of young children. In our study, significant sex differences were apparent for only the question that dealt with simulated tree climbing. Despite the lack of sex differences for questions involving tree choice, the preschool children showed considerable awareness of what trees afford in urgent and prospective circumstances.

As proffered by the savannah hypothesis (Orians, 1980, p. 64), modern humans retain an "evolutionarily programmed" bias for the selection of suitable habitat that includes *aesthetic* preferences for trees that characterize habitat quality. With the advent of agriculture in the late

Pleistocene that profoundly altered human behavioral ecology, such a construct has the tacit assumption that such perceptual biases reflect the evolutionary persistence of behavioral relics under relaxed selection. Based on their experimental findings of age-related changes in landscape preferences, Balling and Falk (1982, p. 25) contend that such an "innate preference of savanna-type environments" is likely to manifest itself in children who lack the more varied landscape experiences of adults (also see Kaplan, 1992). As a caveat to this interpretation for the presence of "innate, evolutionarily determined landscape preferences," Lyons (1983) emphasizes the importance of childhood experiences in different biomes. Her attempt to replicate the Balling and Falk study provided evidence that cumulative experience influenced landscape preferences. She argues further that any interpretation of innate savanna preferences expressed by children must contend with the influence of their recreational experiences in "savannalike parks and backyards."

Our finding in both studies that half the children selected the Australian Pine as the prettiest tree does not support the aesthetic aspects of the savanna hypothesis. Unlike the children we studied, adults interviewed by Orians and Heerwagen (1992, p. 559) selected trees with tall trunks and dense foliage as having the least attractive features. Consistent with this interpretation that children and adults differ in choice of trees with thick foliage, only small proportions of American, Israeli, and Japanese children selected the Fever Tree and browsed Umbrella Thorn as the prettiest tree.

From the point of view of experiential influences on early childhood preferences, the low frequency of Japanese children selecting the browsed Umbrella Thorn is enigmatic because stylized trees with exposed, spreading branches and layered crowns are frequently depicted in ink landscape paintings and prints putatively familiar to these children. On the other hand, frequent exposure of these children to common ornamental cherry, maple, and ginkgo trees with thick, spreading crowns in Tokyo parks and gardens (also see Orians, 1986) might have biased their selection of the unbrowsed Umbrella Thorn as the prettiest tree. Nevertheless with the predominant choice of the unbrowsed Umbrella Thorn for shade and concealment, it seems apparent that the tree choices of 3 to 5 year-old children can be driven by ecologically relevant contexts uncoupled from aesthetic considerations.

Despite this variation in the aesthetic preferences of children and adults, a reasonable argument can still be made for ancestral biases in habitat perception. The possibility that humans retain perceptual, cognitive, and motoric skills under relaxed selection for thousands of generations is consistent with that reported for other species, notably the ability to express appropriate antipredator behaviors during first encounters with former predators in experiments recreating ancestral habitat conditions (reviewed by Coss, 1991; Curio, 1993). The propensity of young girls to climb playground structures more than boys, their greater competence in climbing these structures reflected by fewer injuries, and the spatial aspects of their nighttime fears (Coss &

Goldthwaite, in press) provide empirical support for the evolutionary influence of historical sexual dimorphism (see Susman, Stern, & Jungers, 1984).

The second study examined sex differences in the same vein by probing into whether boys and girls differed in their choice of antipredator refuge sites in trees varying in crown height and width, employing spatial tactics behaviorally analogous to those observed in baboons attempting to evade leopard predation at night. In climbing simulations using the fingers, preschool girls were more cognizant of crown shapes than boys as evinced by greater variation in their choice of refuge sites on trees with the widest crowns. Boys were more consistent than girls in selecting refuge sites closer to the crown midlines and varied less in age in their choice of the highest refuge sites. Discriminant function analysis revealed that most girls selected refuge sites near the crown midlines like those of boys. However, on average for the trees with the widest crowns, girls, especially the oldest girls, selected refuge sites nearer to the crown edge than boys.

The implications that preschool children can distinguish ecologically important aspects of tree configurations in a risk-perception context, especially crown shape, is paramount for identifying other historical contexts that currently affect the perception of habitat affordances. Current evidence that viewing tree foliage from elevated windows has restorative properties in hospital settings (cf. Ulrich, 1984; Parsons, 1991), and that viewing wet, glittery landscapes seemingly promotes the well-being of individuals in isolated and confined settings (cf. Coss & Moore, 1990; Clearwater & Coss, 1991, p. 342) argues for further research on the biomedical aspects of tree perception. It is clear from the applied perspective of landscape design that more research on tree perception must be conducted to identify what factors account for age-related changes in aesthetic preferences. Further study will likely clarify whether the habitat preferences of children are consistently different from those of adults and whether cross-cultural similarities reflect both evolutionary biases and common childhood experiences.

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Figure Captions

Figure 1. Tree silhouettes depicting variation in crown configurations. Trees shown to children were not labelled.

Figure 2. Cross-cultural comparisons of frequency distributions of tree choice by 3 to 5 year-old children as a function of aesthetics and what trees afford in various contexts. Note (C-E) the congruity of the greatest percentage of children selecting the unbrowsed Umbrella Thorn for hiding, sleeping, and safety from the lion.

Figure 3. Comparisons of frequency distributions of tree choice by 3 to 4 year-old American boys and girls. Statistically significant sex differences were not evident for tree choice.

Figure 4. Comparison of frequency distributions of tree choice for seeking refuge from a lion by 3 to 4 year-old American boys and girls (A), and the selection of roosting sites in simulated tree climbing using the fingers (B,C). A sex difference did not appear in the frequency distribution. Average values are shown for the vertical and lateral roosting sites measured from tree silhouettes. Note that 3 year-old girls were more reticent to climb as high as 4 year-old girls (B), and that both the unbrowsed and browsed Umbrella Thorn engendered sex differences in the selection of roosting sites deviating from crown midlines.



Australian Pine
(Pinus nigra)



Fever Tree
(Acacia xanthophloea)



Unbrowsed Umbrella Thorn
(Acacia tortilis)



Browsed Umbrella Thorn
(Acacia tortilis)

Fig. 1

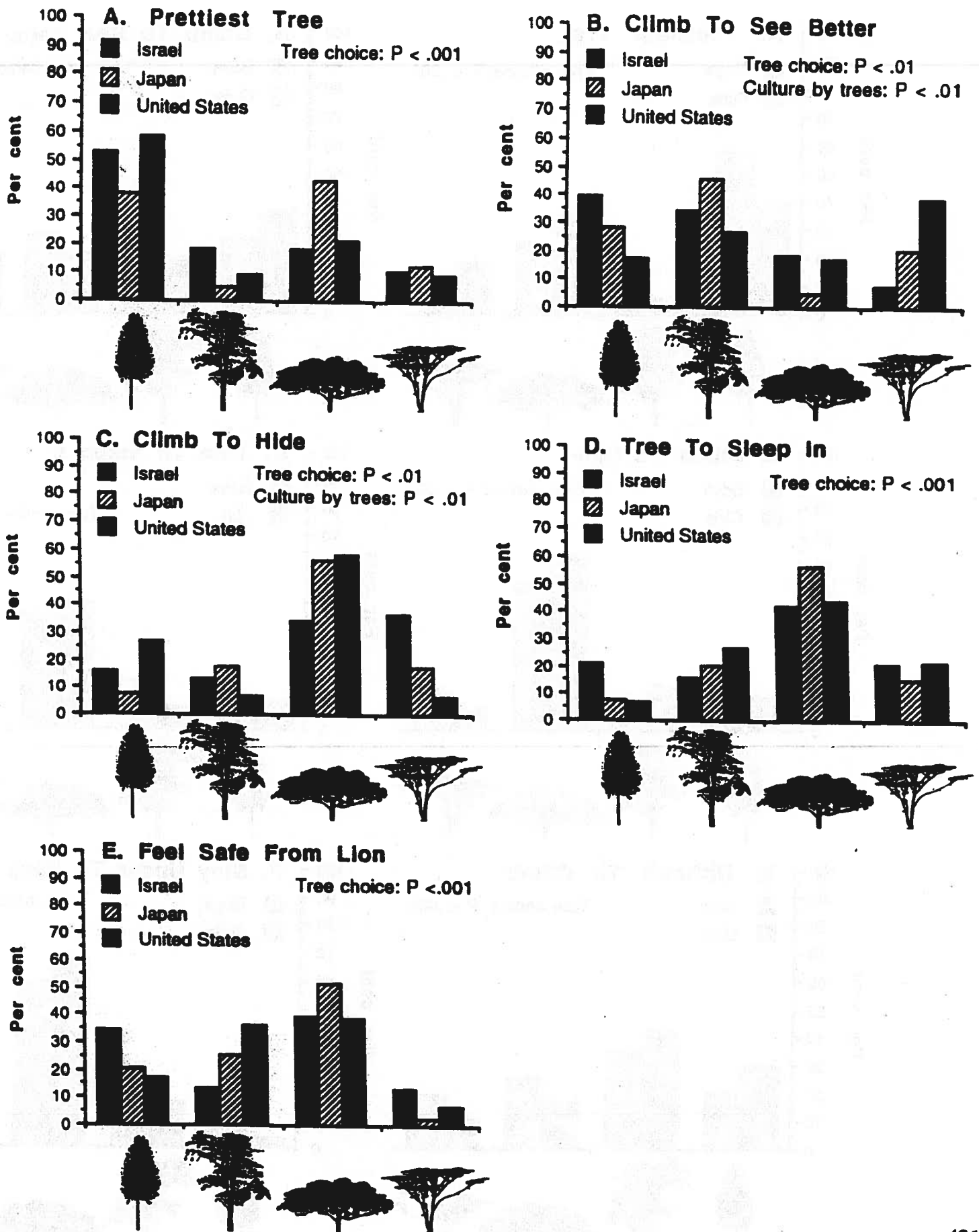


Fig. 2

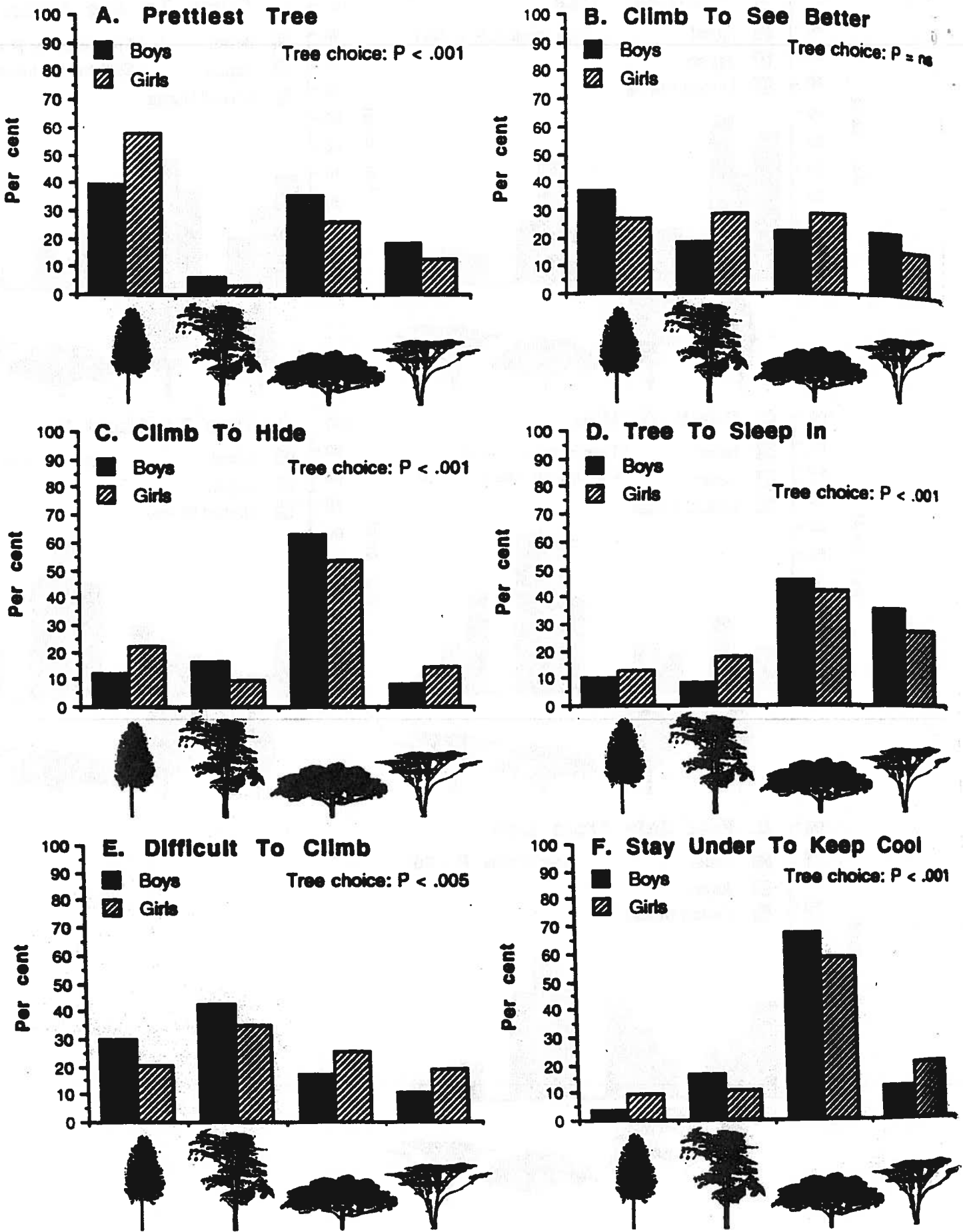


Fig. 3