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The Effect of Viewing Nature and Urban Pictures on Affect and Cognition

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Recent research in environmental psychology has focused on the benefits of natural versus urban settings for people. According to Stress Recovery Theory, being with nature decreases stress induced psychological and physiological arousal. Attention Restoration Theory sees the sensory experience with nature as initiating a shift from top-down to bottom-up processing, which restores the individual's capacity to direct attention. To examine the effect of viewing urban and nature pictures on affect and cognition, a 4 (nature of pictures) x 2 (task groups) randomized design was used. E-Prime 2.0, a psychology software programme was used for stimulus presentation and data collection. No significant differences were obtained on the ratings of feelings. However, significant differences were obtained on response latency. On a complex task, the largest number of errors was seen in the Nature-Pleasant condition. Positive moods induced more superficial processing, whereas negative moods, more analytical or focused processing.

Keywords: nature, urban, mood, attention restoration, stress recovery

The natural scenic beauty in several parts of India provides opportunities for distancing oneself from the routine, opportunities for transcendence and feeling one with the universe; opportunities for addressing our aesthetic, cognitive, emotional and spiritual needs. Connecting with nature, whether in the form of trekking, camping, watching the sunrise or sunset, just sitting by the sea shore, lake, river or stream, gardening or caring for plants, has been known to enhance mood and wellbeing, and heighten feelings of warmth, openness and inspiration (Passmore & Howell, 2014).

The stressful fast paced lives of the urban technological environment, takes its toll on those who move to the city for work. Urban environmental stress, whether from sprawling slums or heaps of garbage, noise or crowding, isolation or discrimination not only increases levels of stress, anxiety and depression, but is often associated with a sense of helplessness and lower subjective well being (Rishi & Khuntia, 2012).

Neuroimaging techniques reveal elevated amygdalic activity (associated with fear, stress and aversive stimuli) and activity in the anterior temporal pole (associated with subjective emotions, anger and depression) in response to viewing urban scenes (Kim et. al., 2010). Overactivity of the amygdala is related to impulsivity and anxiety. Even healthy urban populations have enhanced activity in amygdala while performing challenging cognitive tasks under conditions of perceived social stress. In an fMRI study, Lederbogen et al. (2011) found that city and country dwellers faced with social stress (false feedback on a task indicating a comparatively poorer performance), showed activations in many brain areas. However, the amygdala was activated only in people currently living in the city. Also the cingulate cortex that regulated the amygdala responded more strongly in those brought up in cities. This hyperactivity in the amygdala among the urban dwellers was found to be similar to that seen in depression, anxiety and violent behaviour.

In a follow-up study on the increased risk for schizophrenia in people brought up in cities, results showed a direct association between the perigenual anterior cingulate cortex (pACC) activity levels and years lived in city score. The pACC inhibits activity in the amygdala and if damaged through persistent overstimulation in cities, may fail to suppress this overactivity for city dwellers. The longer one lives in the city, the less the communication between the two areas. This dysfunctional connectivity between

the pACC and the amygdala has been seen in patients with schizophrenia and those at an increased genetic risk for schizophrenia and mood disorders. Bonding with a close network of family and friends releases neuropeptide vasopressin, which modulates the pACC-amygdala circuitry (Zink, Stein, Kempf, Hakimi & Mayer-Lindenberg, 2010).

In contrast, viewing nature scenes activate the anterior cingulate and the insula, areas of the brain associated with increased empathy. Further, the anterior cingulate is associated with positivity and emotional stability, and the insula with love (Selhub & Logan, 2012). Spending time in natural surroundings has been shown to promote relaxation and augment cognitive clarity, highlighting the importance of designing cities like Mumbai, in a way that would promote mental health and work performance.

Differing in many ways, spatially, acoustically and semantically, nature and urban settings activate different associations and goals. Several theories explain the effect of nature on physical and mental health and wellbeing. According to Stress Recovery Theory, being with nature decreases stress induced psychological and physiological arousal. Attention Restoration Theory (ART; Kaplan, 1995; 2001) sees the sensory experience with nature as involving bottom-up processing: the involuntary attentional capture of fascinating sights and sounds. On the other hand, urban settings require directed attention or effortful cognitive control to avoid traffic, harried commuters on the public transport, hawkers or even litter on crowded streets. This results in depletion of attentional resources and fatigue called directed attention fatigue (DAF). Even a brief exposure to a natural setting, can bring about a shift from top-down to bottom-up processing, resulting in an increase in cognitive control (Berman, Jonides, & Kaplan, 2008).

Ulrich (1979) found a rapid improvement in positive mental outlook and a decline in fear and stress in undergraduate students, who viewed natural (vs. urban built) scenes immediately after an one hour exam. In other studies using physiological measures like skin conductance, electromyography and pulse transit time, to further evaluate the nature and stress relationship, he found a rapid and more complete recovery from stress, following exposure to natural scenes. In an EEG based study, he found higher alpha activity in response to natural scenes indicating a relaxed, less anxious, wakeful state (Ulrich, 1981).

In an interesting study, Berto (2005) induced mental fatigue via a sustained attention task, following which participants were either shown a set of pictures selected for cognitive restoration potential (natural scenes) or low cognitive restoration potential (urban settings) or geometric patterns, presented in a standardized time condition or self-paced time condition, followed by the sustained attention task again. The results showed a marked reduction in response times, better accuracy in target detection and more correct responses in the group shown natural settings; a restoration of the capacity to direct attention. These results were replicated in another study, with faster reaction times following natural pictures (rated high in fascination) versus urban setting (pictures with lower fascination ratings). In addition, better memory recall was obtained in the group which viewed natural pictures compared to group viewing urban built settings (Berto, Baroni, Zainaghi & Bettella, 2010).

Berman et. al. (2008) tested directed attention abilities as measured by a backwards digit span task following a walk in a vegetation rich park or city streets (experiment 1) and the Attention Network Task, after viewing pictures of nature or urban areas (experiment 2). Significant benefits to performance were seen in both experiments following exposure to nature, both tasks involving directed attention mechanisms. An interesting observation was that cognitive restoration occurred without changes in mood states, suggesting that restorative effects of nature are not simply a more positive change of outlook. Studies have also shown that simulated drives through natural settings like forest roads appear to be less taxing to the automatic nervous system compared to simulated drives through urban settings (Parsons et. al, 1998).

Indoor vegetation has also been used to induce relaxing effects. Participants working in the room with potted plants showed improved

performance between baseline and an evaluation conducted 10 minutes later, on memory recall and complex proof-reading exercises, suggesting that indoor plants can be a substitute to a possibly expensive commute to a natural setting (Raanaas, Evensen, Rich, Sjostrom & Patil 2011).

It is clear that the myriad distractions of urban settings demand cognitive control and directed attention, thereby depleting cognitive resources. In addition, they activate negative emotions. Conversely, nature settings are restorative of attention and often induce positive moods. Positive moods promote top-down, expansive, heuristic, superficial processing whereas negative moods promote bottom-up, externally focused, systematic processing, a single attribute at a time. In this context, it may be hypothesized that if being in nature induces a positive affective state, which in turn reduces selectivity and broadens the scope of attention, in comparison with urban settings which generate negative affective states which constrict attentional focus, then there would be differences in affect and cognition as a function of viewing nature versus urban pictures

Hypotheses :

H1: There are significant differences among the four picture groups in ratings of the imagined experience evoked by the pictures.

H2: There are significant differences among the four picture groups in response latency to ratings of the imagined experience evoked by the pictures.

H3: There are significant differences among the four picture groups in ratings of affect induced by the pictures.

H4: There are significant differences among the four picture groups in response latency to ratings of affect induced by the pictures.

H5: There are significant differences among the four picture groups in errors on the cognitive task.

H6: There are significant differences among the four picture groups in response latency on the cognitive task.

H7: There are significant differences between the two task conditions in errors on the cognitive task.

H8: There are significant differences between the two task conditions in response latency on the cognitive task.

H9: There is a significant interaction among the four picture groups and two task conditions in errors on the cognitive task.

H10: There is a significant interaction among the four picture groups and two task conditions in response latency on the cognitive task.

H11: There are significant differences among the four picture groups in post task ratings of task difficulty, physical and mental fatigue

H12: There are significant differences among the four picture groups in response latency to post task ratings of task difficulty, physical and mental fatigue

Method

Design:

A 4 (picture groups) x 2 (task groups) randomized design was used. Nature-Pleasant, Nature-Neutral, Urban-Neutral, Urban-Unpleasant were the 4 picture group conditions. Within each of these conditions, participants were exposed to either a simple cognitive task or a complex cognitive task, which were the 2 levels of cognitive task complexity.

Participants:

Young adults from two reputed educational institutions in Mumbai (20 females, 20 males) were recruited for the study (age range 18-25 years, M_{Age}= 22.95 years, ±1.87). Informed consent was obtained from the participants.

Materials:

The pictures for the four conditions, namely Nature-Pleasant (NP), Nature-Neutral (NN), Urban-Neutral (UN) and Urban-Unpleasant (UU) were selected on basis of a preliminary study conducted prior to main study. 10 participants rated 90 pictures representing scenes of nature and urban settings (45 nature pictures mainly selected from Berman (2008), 45 urban pictures being photographs taken of different parts of

Mumbai) on a scale ranging from 1(unpleasant) to 7(pleasant). Based on the Mean and SD of the ratings in the preliminary study, 40 pictures were selected for the main experiment, categorized into NP (M = 6.46 (0.18), NN (M = 5.16 (0.57), UN (M = 4.23 (.92) and UU (M = 1.49 (0.32). The Nature-Unpleasant and Urban-Pleasant conditions were not included as they were not representative of scenes likely to be normally encountered by commuters in Mumbai.

A Navon type global/local task was designed as measure of cognitive control, to test task switching flexibility. In the simple condition, the Navon figure was a geometrical shape, either a triangle or a square, in red or blue, made up of smaller triangles or squares in red or blue. The larger and smaller figures were either congruent (large shape a square composed of smaller squares, or a triangle composed of smaller triangles) or incongruent (large shape a square composed of smaller triangles or a triangle composed of smaller squares). There were equal number of congruent and incongruent trials in red and blue in the simple task condition. In the complex task condition, digits were used, for example the number 9 composed of smaller numbers 2, or 6, or 8. Complexity was thus defined in terms of cognitive load, the number of possible global characters and the number of possible local characters, which determined the number of congruent trials (on which cognitive load is less). There were 2 possible global or local characters in the simple condition (square or triangle), whereas in the complex condition, there were 4 possible global characters (numbers 6 to 9) and 3 possible local characters (numbers 2, 6 or 8). In both conditions the stimuli were presented in two colours, both colours presented equally often. While 50% of the 24 trials in the simple condition were congruent, only 16.67% of the 24 trials in the complex condition were congruent.

Procedure:

To control for mental state and establish equivalence in mental fatigue between the groups prior to the main experiment, participants were presented with three levels of the n-back task, a working memory task with a large attentional component. No significant differences were obtained between conditions either on errors on the final 3-back task, or on task difficulty, physical fatigue and mental fatigue ratings.

In the main experiment, participants were exposed to the selected set of nature and urban pictures using software e-prime 2.0. To get participants involved in viewing the picture, they were asked to imagine being in the settings and to rate the settings in terms of their experience of the settings as well as the corresponding feelings evoked by those settings. Each picture stayed on-screen for 5000 ms to ensure ample time. Participants rated the settings on six attributes (for example, beautiful, attractive, pleasant) on a 7-point scale immediately after watching each picture. Following this, they rated feeling evoked by the setting on a 7-point scale, on eleven feeling-related attributes (for example, peace, joy, sadness) and eight 5-point bipolar scales (for example, excited-calm, in control-controlled)

Participants were then presented with a Navon type global/local task In the simple cognitive task condition, participants were told that they would be presented with a randomized sequence of geometrical figures made out of smaller geometrical figures either in red or blue colour. If the figure was blue in colour, they had to respond to the smaller shape with which the whole figure was made and press the corresponding key for example, if a square was made out of smaller triangles, they had to press ‘t.’ If the figure was in red colour, they had to look for the overall shape of the figure and press the corresponding key, for example, if the square was made out of smaller triangles, they had to press ‘s.’ They had to respond as quickly and as accurately as possible. The basic task was the same in the complex cognitive task condition, except that digits were used, for example the global character 9 made out of smaller twos or sixes or eights. If the digit was presented in blue, they had to respond to the smaller digit with which the whole figure was made and press the corresponding key, for example, if a 9 was made out of smaller 2s, they had to press ‘2.’ If the digit was in red colour, they had to look for the larger digit and press the corresponding key.

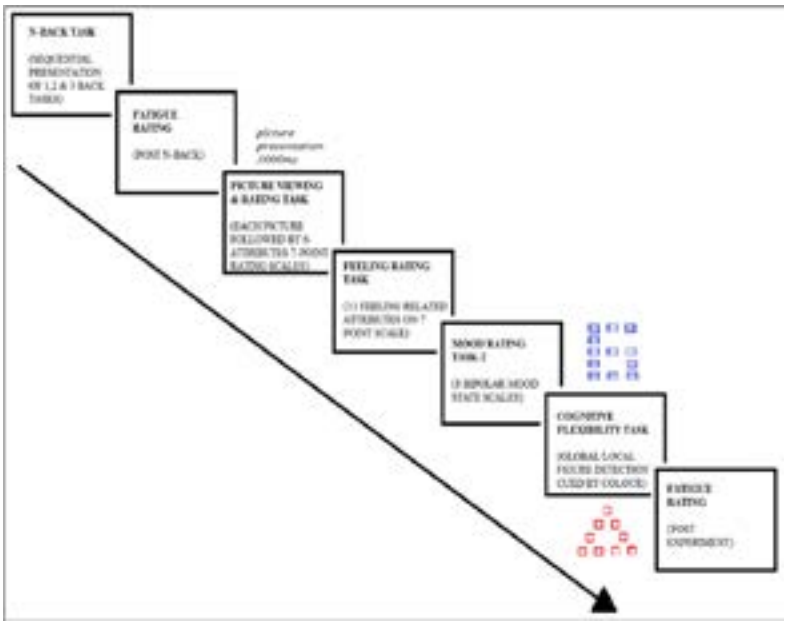

Figure 1. Experimental sequence.

In the example above, they would have had to press '9'.

Following this, participants were asked to rate (on a 5 point Likert scale) the extent to which they found the task difficult, experienced physical fatigue and experienced mental fatigue on the task.

Results

Ratings of imagined experience in the settings and Response Latency to the same:

A MANOVA examined the association between the four picture groups and two task conditions as IVs and ratings of the imagined experience of the setting as DV. Results demonstrated a significant effect of picture group (See Table 1). In accordance with H1, there were statistically significant differences among the four picture groups on all six attributes ($p = .0001$), indicating that participant ratings were consistent with the ratings from the preliminary rating study.

The MANOVA for response latency to the ratings was not significant. There were no significant differences in response latency between conditions. Thus, H2 was not supported.

Affect induced by pictures: Ratings and Response Latency on Feelings

The negatively framed items were reverse scored. There were no statistically significant

Table 1. Significant Multivariate Effects

Variable(s)	Wilks' Lambda	F	df	Error df	p	η^2p
1. Picture Group on Picture Rating	.122	4.722	18	76.853	.0005	.505
2. Picture Group on Response Latency for Rating of Feelings	.136	1.921	33	65.520	.012	.486
3. Picture Group on Response Latency for Bipolar Ratings	.223	2.067	24	73.109	.010	.394
4. Picture Group on Post task ratings	.558	2.206	9	73.163	.031	.177

Table 2. RT on Affect Ratings

Dependent Variable	Picture group								
Feeling	NP		NN		UN		UU		
	RT	Std. Error	RT	Std. Error	RT	Std. Error	RT	Std. Error	p
1. Part of something larger than myself	8126.475	1164.929	10819.300	1098.306	4643.233	1051.548	2987.667	1120.954	.0005
2. Angry	5360.000	943.095	3475.500	889.159	2321.383	851.304	1464.875	907.494	.032
3. Good about myself	3585.975	572.819	4188.000	540.059	1977.800	517.067	1198.583	551.196	.002
4. Isolated and disconnected from the rest of the world	4566.375	804.722	5137.000	758.700	2884.250	726.400	1667.667	774.345	.012
5. Positive	3537.950	831.239	4995.400	783.699	2205.850	750.335	1319.417	799.860	.014
6. At ease	4410.800	532.283	3943.900	501.841	2090.650	480.477	1297.542	512.190	.0005
7. Joy	2795.425	492.892	3547.700	464.704	985.450	444.920	1102.000	474.286	.001
8. Peace	2536.175	368.023	2632.500	346.975	1202.850	332.203	844.000	354.130	.001
9. Negative	2300.525	379.814	3002.100	358.093	1727.950	342.847	1385.292	365.477	.018
10. Sad	4401.775	648.709	4196.300	611.608	1956.050	585.570	1236.458	624.220	.001
11. Anxious	9633.600	1949.465	6072.200	1837.974	2198.050	1759.726	805.667	1875.874	.010

differences obtained on the MANOVA that examined the association between the four picture groups and two task conditions in ratings of affect and mood induced by the pictures. H3 was not supported. However, a significant MANOVA on time taken to respond was obtained (See Table 1). Results showed a main effect of picture group on response latency to the ratings for all eleven feelings (ranging from p = .0005 for at ease and part of something larger than self to p = .03 for angry, see Table2), thus providing support for H4. Tukey's HSD showed significant differences in response latency on almost all ratings of feelings ($p < .05$) with the Nature conditions (NP, NN) taking longer to respond than the Urban conditions (UN, UU).

An ancillary observation was the significant interaction effect on time taken to respond to the ratings (ranging from p = .001 for part of something larger than self to p = .036 for isolated and disconnected from the rest of the world), with the Nature-Neutral, Complex Task condition taking the longest time to respond to the ratings, followed by the Nature Pleasant, Simple Task condition except for the feelings of anger, at ease, peace, and negative, where the Nature Pleasant, Simple Task condition was slower (See Table 3).

Affect induced by the pictures: Bipolar Scale Ratings and Response Latency

After reverse scoring the bipolar scale ratings to ensure that the negative attribute = 1 and the positive attribute = 5, a MANOVA was conducted to examine the association between the four picture groups and two task conditions on the bipolar ratings of the affect induced by the pictures. No significant differences were obtained, a finding which is in line with the results on ratings of feelings discussed above.

However, a MANOVA on response latency showed a statistically significant picture group effect on time taken to respond to the eight bipolar scales (See Table 1). Quoting Bonferroni adjusted p-values, Nature-Pleasant took significantly longer to respond than Urban-Neutral and Urban-Unpleasant to excited-calm (p = .008 and p = .002 respectively,) and weary-

Table 3. Comparison of RT for Affect Rating in the various conditions

		RT Simple Task	RT Complex Task
Feeling	Picture	Mean(SD)	Mean(SD)
Something larger than myself	NP	11969.2 (5738.30)	4283.75 (3157.35)
	NN	7609 (3306.33)	14029.6(5714.60)
	UN	5347.8 (1241.91)	3938.667 (2602.0)
	UU	1936.5 (1232.78)	4038.833 (1044.53)
Angry	NP	5932 (3673.87)	4788 (3967.30)
	NN	1869.6 (731.32)	5081.4 (4105.89)
	UN	2879.6 (2579.28)	1763.167 (2872.29)
	UU	491.75(291.38)	2438 (1679.08)
Good about myself	NP	4113.2 (2154.84)	3058.75 (862.60)
	NN	3774.2 (1191.84)	4601.8 (2833.44)
	UN	2591.6 (1659.2)	1364 (1610.39)
	UU	295 (40.32)	2102.167 (1466.16)
Isolated and disconnected from the rest of the world	NP	5416 (2587.64)	3716.75 (1323.02)
	NN	4100.8 (1063.69)	6173.2 (3975.26)
	UN	4685 (4061.58)	1083.5 (1425.73)
	UU	927 (814.07)	2408.333 (1121.72)
Positive	NP	4192.4 (2424.01)	2883.5 (1186.94)
	NN	4173.2 (1024.17)	5817.6 (5763.37)
	UN	3294.2 (2185.50)	1117.5 (1197.29)
	UU	513 (606.07)	2125.833 (935.17)
At ease	NP	5644.6 (1289.43)	3177 (1586.92)
	NN	3087.8 (1376.02)	4800 (2571.92)
	UN	2663.8 (2158.08)	1517.5 (1437.81)
	UU	434.25 (195.24)	2160.833 (808.96)
Joy	NP	2119.6 (819.52)	3471.25 (2448.30)
	NN	2252.4 (1039.22)	4843 (2955.34)
	UN	1005.4 (314.74)	965.5 (1200.42)
	UU	288 (45.10)	1916 (560.61)
Peace	NP	3180.6 (1358.60)	1891.75 (692.44)
	NN	2162.8 (1215.15)	3102.2 (1212.77)
	UN	968.2 (310.47)	1437.5 (1848.02)
	UU	276.5 (108.44)	1411.5 (288.94)
Negative	NP	2884.8 (1195.86)	1716.25 (760.73)
	NN	2393.2 (912.89)	3611 (1809.94)

	UN	2476.4 (1020.44)	979.5 (840.49)
	UU	629.75 (728.34)	2140.833 (1253.11)
Sad	NP	5092.8 (2948.22)	3710.75 (1226.91)
	NN	2494.6 (1162.17)	5898 (2018.57)
	UN	2504.6 (2902.57)	1407.5 (1774.39)
	UU	387.75 (214.23)	2085.167 (1351.74)
Anxious	NP	5795.2 (4762.13)	13472 (13668.11)
	NN	2884 (1706.01)	9260.4 (9696.03)
	UN	2420.6 (1934.62)	1975.5 (2242.51)
	UU	463 (243.95)	1148.333 (609.34)

fresh (p = .024 and p = .014 respectively). Nature Pleasant took longer than Urban Unpleasant to respond to submissive-dominant (p = .047). Nature-Neutral took significantly longer to respond than Urban-Neutral and Urban-Unpleasant to happy-unhappy (p = .001 and p = .017 respectively) and friendly-unfriendly (p = .010 and p = .001 respectively). Nature Neutral took longer to respond than Urban Unpleasant to weary-fresh (p = .040), sleepy-wide awake (p = .002) and submissive-dominant (p = .007).

Thus, results were inconsistent with H3 on both measures of affect while providing support for H4 on response latency.

Table 4. ANOVA: Response Latency on Bipolar Ratings of Affect

	Picture Group		
Bipolar Scales	F (df 3, 32)	p	η^2p
happy-unhappy	6.784	.001*	.389
excited-calm	7.012	.001*	.397
in-control-controlled	3.124	.039*	.227
friendly-unfriendly	6.774	.001*	.388
weary-fresh	6.060	.002*	.362
sleepy-wide awake	5.538	.004*	.342
despair-hopeful	2.041	.128	.161
submissive-dominant	4.813	.007*	.311

*Significant at the .05 level

Cognitive Control: Task Switching Flexibility Errors and Response Latency

In relation to H5, ANOVA showed that the difference among the four picture groups in errors approached significance $F(3,32) = 2.852$, $p = .054$, $\eta^2p = .209$. However, H6 based on difference among the four picture groups in response latency was not supported. H7 on differences between the two task conditions in errors was also not supported (p = .076). In accordance with H8, there was a significant difference between the two task conditions in response latency $F(1,32) = 4.896$, $p = .034$, $\eta^2p = .133$, although it was the simple task condition that took significantly longer to respond than the complex task condition $F(1,32) = 4.896$, $p=.034$, $\eta^2p=.133$. There was a significant picture group x task group interaction on errors with the largest number of errors seen on the complex task in the Nature-Pleasant condition, $F(3,32) = 3.931$, $p = .017$, $\eta^2p = .269$, providing support for H9. The simple task condition was more or less consistent in their performance (number of errors made) while taking overall larger average response time. A trade-off was observed between performance accuracy and response time in the Nature-Pleasant complex task condition (See Figs. 2 and 3). There was no interaction effect for response latency, hence no support for H10.

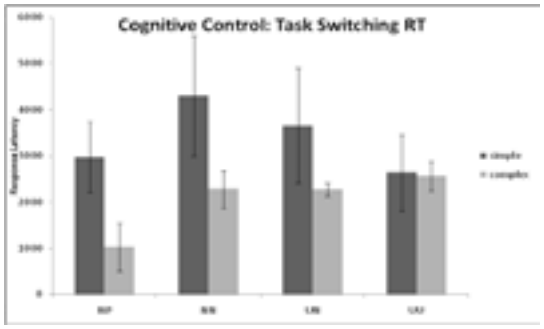

Figure 2. Mean RT for the four picture groups on the cognitive flexibility task.

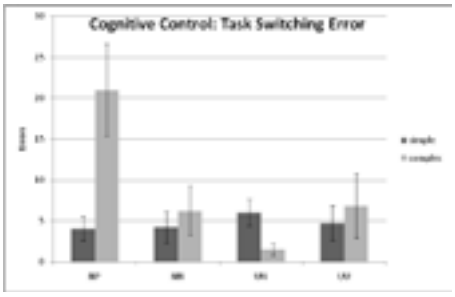

Figure 3. Mean error for the four picture groups on the cognitive flexibility task.

Post task ratings:

The MANOVA on post task ratings was significant (see Table 1). There was a significant main effect of picture group on ratings of task difficulty $F(3,32) = 4.135$, $p = .014$, $\eta^2p = .279$, ratings of physical fatigue $F(3,32) = 3.793$, $p = .020$, $\eta^2p = .262$ and ratings of mental fatigue $F(3,32) = 6.190$, $p = .002$, $\eta^2p = .367$. The Nature-Pleasant ratings of task difficulty, physical fatigue and mental fatigue were significantly lower than that of Urban-Unpleasant ($p = .012$, $p = .015$, $p = .001$ respectively, Bonferroni adjusted). The results provided support for H11.

Post task rating: Response Latency

The MANOVA on response latency to post task rating approached significance ($p=.098$) There was a significant between-subjects effect of picture group on response latency to ratings of task difficulty $F(3,32) = 4.848$, $p = .007$, $\eta^2p = .312$. The Nature-Pleasant condition took significantly longer to respond to the task than the Urban-Neutral ($p = .034$, Bonferroni adjusted) and Urban-Unpleasant conditions ($p = .024$, Bonferroni adjusted). The trend was in line with H12.

Discussion

This study on the effect of viewing nature and urban pictures on affect and cognition showed that different imagined experiences were evoked by the pictures, although these were not reflected on ratings of affect induced by the pictures. There were however differences in response latency to those ratings. On the cognitive task the largest number of errors was on the complex task in the Nature-Pleasant condition. There were also significant differences on post task ratings of task difficulty, physical and mental fatigue, with the Nature-Pleasant ratings being significantly lower (and response latency higher) in comparison to the Urban-Unpleasant condition.

The significant differences on picture ratings indicate differences in the picture settings, consistent with ratings in the preliminary study. The simple and complex groups did not differ on picture ratings, which supports the equivalence of the two conditions for imagined experience evoked by the pictures.

There are several possible explanations for the failure to obtain significant differences on ratings of feeling induced by the picture. One is that the participants did not take the rating task seriously. However, this is not likely as there was a significant difference in response latency in the nature and urban conditions. Another possible explanation is that exposure to the pictures may have induced a diffuse state, one that is not intense or specific enough to be subjectively experienced as an identifiable feeling. Perhaps, the number of pictures or the exposure time for each picture was not adequate enough to generate a consciously distinctive perception of the feeling. In the Berman et al. (2008) study, participants viewed pictures for approximately 10 min (inclusive of ratings of liking of the picture). Also, there were 50 pictures displayed for 7 s. In comparison in the present experiment, the exposure duration (5s) and the number of pictures (n=10) may have

been insufficient to produce a distinguishable feeling. A video presentation, which would have included sounds, more in tune with the present high tech age may have been more effective. It is important to note that mixed findings have been reported with respect to the affect induced from passive viewing of representations of natural landscapes. Another reason for the failure to find any difference in affect between picture conditions may be the participants' lower level of daily contact with nature as also the participants' adaptation to the urban environment stemming from a daily exposure to the same; the detachment or distancing coping strategy that may have blurred a conscious emotional response to the unpleasant images.

On response latency to ratings of feelings, there was a significant interaction effect, with the Nature-Neutral groups taking the longest time to respond to the affect ratings. The Nature-Neutral groups were not generally slower in response latency. On the bipolar ratings, the Nature-Pleasant condition was also slow to respond. The difference in speed of response to the ratings may have been due to the broadening of the focus of cognition and attention, induced by the nature images. The faster responses in the urban conditions may have been due to the automatic neurobiological response of the limbic system to the unpleasantness experienced in the congested, crowded situations portrayed in the images, a possible 'fleeing away' survival strategy remnant of our evolutionary past. That the urban groups may have been faster in response latency to begin with is unlikely, given the nature of random assignment to conditions and the failure to obtain significance between groups in response latency to ratings of imagined experiences in settings.

The largest number of errors on the complex task in the Nature-Pleasant condition may have been due to a mood induced difference in processing strategy. Phillips, Bull, Adams & Fraser, 2002) found that on switching tasks, positive mood causes poorer performance compared to neutral mood. From an evolutionary perspective, emotions and moods provide information about the nature of a situation. A positive mood would indicate that the current environment is threat free, hence careful information processing is not necessary. Negative moods in contrast would imply a problematic situation, one that calls for orientation to detail, careful inspection and assessment, and a more thorough and effortful information processing, one that is usually adaptive in dealing with problematic situations (Schwarz, 1990, Schwarz & Clore, 2007). The shallow, superficial, heuristic processing seen when one is in a good mood, due to the activation of mood congruent memories, which result in insufficient cognitive resources left over for more systematic, elaborative processing (Isen, 1987, Mackie & Worth, 1989) could be another reason for the errors. A positive mood is associated not only with a less problematic perception of the task but also to overconfidence in ability to handle the task in question. Thus, a positive mood may have led to a less cautious approach to the task and a broader but also more superficial processing. Furthermore, persons in a good mood refrain from investing cognitive effort in tasks unless doing so ensures a continuation or enhancement of their current mood state (Isen, 1987; Wegener, Petty, & Smith, 1995). And attaining success on a resource intensive executive function task is rarely motivation for expending cognitive effort. A study on categorization and mood found similar results with no particular positive mood facilitation in processing (Goritz & Moser, 2003). Mild levels of stress in the Urban Unpleasant condition may have actually facilitated a constricted but deeper controlled, cautious, systematic and analytic processing.

In the Nature-Pleasant condition, participants' ratings of task difficulty, physical fatigue and mental fatigue were lower than the Urban Unpleasant condition suggesting the restorative power of Nature.

Visual contact with nature is relaxing and restorative and has a beneficial effect on health and well-being (Grinde & Patil, 2009). Performance on complex tasks is hindered, but positive moods benefit social relationships. When in a happy, elevated mood, viewing the world through rose coloured lenses, one is more empathic and forgiving and less likely to notice

incongruencies in thought, word and action. Conversely, negative affect improves attention to detail, hence it may improve the ability to detect deception, increase accuracy in social judgments, reduce dependence on schemas and stereotypes, increase skepticism and diminish gullibility. However, negative moods have also been associated with stress and aggression, which could trigger the onset of a negative chain reaction.

One of the limitations of this study is the incomplete design used, wherein Nature-Unpleasant and Urban-Pleasant categories were not included. There is also a need for greater control over the pictures selected, for example, there should have been a careful balancing across the categories of the number of Nature and Urban pictures (for example, with and without water or vegetation) that were pleasant, neutral and unpleasant. It would have also been better to have used the Perceived Restorativeness Scale (Hartig, Korpela Evans, & Gärling 1997) with the subscales of Being Away, Fascination, Coherence and Compatibility, to study the impact of nature and urban settings. Given the limitations of self report measures, some of the current methods of cognitive neuroscience should be incorporated.

Conclusion

Nature has a soothing and calming effect on frayed nerves. Viewing scenes of nature is a low-cost and effective option for urban dwellers faced with innumerable stressors on a daily basis. A positive mindset will broaden thought-action repertoires and reduce stress.

The Swachh Bharat Abhiyan (Clean India Campaign) was launched on October 2, 2014. In urban settings, clean neighbourhoods have been found to reduce crime, domestic violence and feelings of helplessness (Faber Taylor, Kuo & Sullivan, 2002). From an ecological perspective, identification with and personalization of the areas around oneself engenders a sense of community, a collective ownership, which promotes bonds of friendship so crucial to urban well being (McSweeney, Rainham, Johnson, Sherry, & Singleton, 2014). An awareness of urban environmental stress and its management options will help city dwellers develop environmental resilience and subjective well being (Rishi & Khuntia, 2012).

In the long run, trees may help 'transcend' the traffic and turmoil of city life. Having potted plants or fish tanks at home, at school or in the workplace may be a good idea after all.

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Appendix

A

NP


NN

B


UN


UU

Sample images from the experiment (A) images from the nature set (B) images from the urban set Nature-Pleasant (NP), Nature-Neutral (NN), Urban-Neutral (UN) and Urban-Unpleasant (UU)

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