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Psi as Compensation for Modality Impairment — A Replication Study Using Sighted and Blind Participants

Lance Storm and Mikele Barrett-Woodbridge
Anomalistic Psychology Research Unit, School of Psychology,
University of Adelaide, Adelaide, Australia

Abstract

A replication study of an earlier study by Storm and Thalbourne (2001) was conducted to test the hypothesis that blind people compensate for their impairment by developing superior psi ability compared to sighted people. Participants had to describe a concealed line drawing (target), and then rank four drawings (1 target + 3 decoys) from 'most likely' to be the target to 'least likely'. The concealed picture was removed from its envelope and assigned its corresponding rank. A significant psi effect was found for the whole sample, and for the sighted sub-sample, but not the vision-impaired sub-sample. An above-chance success-rate of 28% (π = .54, where π_{MCE} = .50) was found for the totally blind, which was superior (not significantly) to the rest of the sample (i.e., sighted + partially sighted participants) with their hit-rate of 26% (π = .51). In the present replication study, it was hypothesized that totally blind individuals have superior psi test performance to sighted individuals. However, the totally blind group and the sighted group both scored at the same below-chance hit-rate of 21% (p = .365; π = .45). There was thus no evidence that psi compensates for total blindness. When the dataset from the present study was combined with Storm and Thalbourne's (2001) dataset (total N = 160), the sighted group scored significantly above chance on the sum-of-ranks measure (p = .040). It was argued that if there is compensation for blindness, it might work in ways other than paranormal.

Correspondence details: Lance Storm, Anomalistic Psychology Research Unit, School of Psychology, University of Adelaide, Adelaide, SA 5005, Australia. Email: lance.storm@psychology.adelaide.edu.au.

Introduction

As far back as 1891, blindness, imagery and anomalous (ostensibly paranormal) performance have been topics of interest for parapsychologists (Alvarado, 1988). F. W. H. Myers (1891) believed that paranormal ability might manifest in the blind, and he suggested that the blind person:

> "...will exercise a sight, which he [*sic*] does not recognize as sight, which belongs in fact to that pre-natal undifferentiated continuum of perceptive faculty of which telepathic and clairvoyant phenomena show us the vestigial or obsolescent trace." [1]
>
> (F. W. H. Myers, 1891, p. 127)

It was not until the 1930s that Price and Pegram (1937) investigated psi performance in the vision-impaired, a group which included partially vision-impaired individuals. Using Zener cards (25 cards with five each of five Zener symbols: Star, circle, square, cross and wavy-lines), Price and Pegram administered runs of 25 calls to participants using three matching techniques: Open Matching (cards in the pack are face down and the participant sorts them into 1 of 5 identified key cards), Blind Matching (same as Open Matching, but the key cards are not identified), and Match Piling (the participant divides the 25 cards into 5 piles, and names the piles, e.g., "this is the circle pile, that is the star pile," etc.). Price and Pegram found that age and extent of impairment did not make significant differences to scoring trends. Even more surprising was the fact that scores actually improved when the cards in the pack were placed in opaque sealed envelopes.

Price and Pegram (1937) recognized the problem of testing a specific group without using a control group for comparative purposes (i.e.,

[1] One referee of the present article suggested that Myers did not mean that blind people would have their psi function sharpened due to loss of some other modality. We are not claiming he did. We merely take a lead from Myer's words, in order to run with the idea that vision-impaired people (especially those born blind) might, by default, maintain a close connection to a function that is related to psi in some way, and may be enhanced as a corollary of the fact that they are vision-impaired, whereas for sighted people the connection to the psi component of that function may be diminished as a consequence of undergoing a developmental process which, as a matter of convenience, we might call 'normal sight-training' that ultimately becomes the dominant sensory modality.

they did not test sighted people). They concluded that the "high proportion [of hits] cannot be considered significantly unusual until further research has been done with non-blind groups of comparable age and grade under similar social conditions" (p. 153). Consequently, in a follow-up study, Price (1938) tested vision-impaired and sighted participants so that performance comparisons could be made. The two groups "were selected for similarity on age and institutional status" (p. 286). There were 66 "blind" and 40 "seeing" participants. Open Matching and Blind Matching methods were primarily used, as in the Price and Pegram (1937) study. When both groups were combined, overall scoring was significantly above chance. The vision-impaired produced higher average scores than the sighted, but the differences were not significant. When cards were sealed in opaque envelopes, scoring was significantly higher for both groups compared to the 'open-card' method. Price concluded that "something meaningful" (i.e., "extra-sensory perception") took place in the tests, and she dismissed the rival hypotheses of sensory leakage that might explain the effects, as was shown by the fact that "subjects scored better in tests with enclosed cards than with the open cards" (p. 282).

Gonzales-Scarano (1982) looked at paranormal task performance in the sighted and the vision-impaired. She (after Paivio, 1971) assumed compensation in those who suffered from impairment in one of the normal modalities, and she theorized that unconscious visual and/or auditory images would be activated into consciousness by noncognitive factors, which could even be paranormal in nature. A visual memory test similar to that of Paivio and Okovita (1971) was used. High-visual/low-auditory word-pairs and high-auditory/low-visual word pairs were randomized and presented verbally to the participants. The paranormal component of the test was described as involving the identification of pre-designated specific word targets. The experimenter was 'blind' to the identity of the targets. Two hypotheses were proposed: (i) the sighted would recall more 'high-visual concrete nouns' than the congenitally totally blind, and (ii) the congenitally totally blind would recall more 'high-auditory concrete nouns' than the sighted. Both hypotheses failed to be confirmed. These results suggest that the totally blind participants were no more advantaged or disadvantaged than the sighted.

Like Price (1938), Barnard and Nelson (1983) also ran a card-matching task using 10 sighted and 10 "nonsighted" participants. They hypothesised that the nonsighted would perform significantly better than the sighted, especially when the nonsighted were allowed to "touch" (i.e., "directly handle," p. 58) the cards, rather than not touch them. There were therefore four groups, but no significant main effect, or interaction effect, was found. However, a significant variance difference was found (as a so-called F max ratio of the variances) between the sighted and nonsighted groups. Also, in a *post-hoc t*-test comparing overall group scores to chance, significant "psi hitting" was found for the "nonsighted" (p. 59). The combined sample of 20 participants also produced a significant hit rate, but only in the 'touch' condition.[2]

Overall, the few available studies show that there is only a suggestion that performances of the vision-impaired may be superior to those of the sighted. Perhaps, more importantly, Gonzales-Scarano's (1982) negative findings suggest that the vision-impaired and the sighted should not be treated as incommensurable groups when given tasks that test their capacities to form images in their minds. There may be no good reason not to compare the vision-impaired and the sighted.

Storm and Thalbourne's (2001) experiment

Thalbourne's (2004) "diasomatic hypothesis" proposes that paranormal processes are seen as acting both "inside and outside the body" (Thalbourne, 2003, p. 31). This hypothesis emerges from his *Theory of Psychopraxia*, where psychopraxia is defined as:

> "A ... principle underlying all interactions between the self, or ego, and the realm consisting of mental and physical events, whereby *under certain conditions* ... the adoption of a pro attitude ... results in its fulfillment in reality. Paranormal phenomena may thus be seen as special instances of psychopraxia, being those manifestations of goal-achievement which are exosomatic rather than endosomatic, i.e., which are not mediated by the normal sensory-motor apparatus."
>
> (Thalbourne, 2003, p. 100)

[2]The other referee of this article suggested that psi hitting in the "touch" condition might be an artefact of tactile contact (i.e., "handling the stimuli"). Though possible, we would have to make the unlikely assumption that the card-symbols, printed in ink on cardboard cards, could be felt through the thick envelope. We would suggest that tactile contact is merely psi-conducive because it creates a feeling of psychological propinquity that helps overcome the psychological distance between the symbol and the participant, whereas the non-touch condition may have a distancing effect.

Psychopraxia is thus the self (*psyche*) bringing about goals (*praxia*, from the Greek *prattein*: "to accomplish") endosomatically in the mind-body complex, or exosomatically in the wider world.

Exosomatic psychopraxia (or the self enacting an effect external to the body, otherwise referred to as a paranormal effect) acts either in a compensatory way (substitution mode) or as a 'spill-over' effect. Exosomatic psychopraxia can therefore be seen as a compensation for some temporary or permanent ostensibly 'adverse condition' (e.g., vision-impairment). Storm and Thalbourne's (2001) initial experiment with the vision-impaired (described below) was the first of its kind in which vision-impaired participants were administered a free-response task rather than a forced-choice (card-guessing) task, as was the case in Price and Pegram's (1937) study.

Storm and Thalbourne asked sighted and vision-impaired participants to describe verbally a concealed randomly selected line drawing. Participants then ranked, from 1 to 4, four pictures that were removed from another envelope and placed in front of them (one of the pictures was a copy of the target picture and the other three were decoys). Totally blind participants had the four pictures described to them by the experimenter since they could not see them. Rank-scores were analysed using the sum of ordinal weighted ranks formula (Solfvin, Kelly, & Burdick, 1978, p. 99). Storm and Thalbourne found that the sighted significantly out-performed the vision-impaired, but their experiment was less than ideal given that totally blind participants were not readily available so that the sub-sample of vision-impaired had to include *partially* blind participants, many of whom were elderly with vision problems at the time of testing, but nevertheless did have good vision for most of their lives.

In a *post-hoc* analysis, Storm and Thalbourne conducted an analysis of rank-scores for both vision-impaired subgroups (i.e., totally blind and partially blind). They found that 28% of the totally blind subgroup (n = 18) scored a rank of 1 (i.e., correct on the first guess) whereas only 13% of the partially blind subgroup (n = 24) scored a rank of 1. This direct-hits rate for blind participants translated as an effect size of π = .54 (where π is a 'proportional index' based on the proportion of direct hits),[3] which was actually greater than the effect size of π = .51 for the

[3] $\pi = \frac{P(k-1)}{[1+P(k-2)]}$ where P is the raw proportion of hits, and k is the number of alternative choices available. Bem and Honorton (1994) point out the advantage this measure has in providing a "straightforward intuitive interpretation" (p. 8) of the effect size, because π is the "proportion correct, trans-

remaining 66 sighted and partially blind participants (direct-hits rate: p = .26). Though the differences were not significant, Storm and Thalbourne conjectured that the sighted and partially sighted participants might have no advantage over the totally blind participants.

The replication experiment described in the present study used totally blind participants only, rather than partially blind participants, in order to test Thalbourne's compensation hypothesis more effectively. The major aim was to determine whether totally blind participants could use psi in a compensatory way that would result in performance superior to that of sighted participants.

Method

Participants

Total number of participants was 76. Mean age was 55 (*SD* = 18 years). The experimental group consisted of 38 totally blind participants (mean age = 55, *SD* = 18 years) randomly selected from vision-impaired communities with the assistance of the various institutes that represent this group.[4] The control group of sighted participants were drawn from the general population, and they were matched with the experimental participants on age and sex (n = 38; mean age = 55, *SD* = 18 years).

Procedure

After the School of Psychology, University of Adelaide, granted ethics approval to conduct the experiment, the project leader (L. S.) initiated contact with the management of the participating institutions that represented the vision-impaired communities. The experimental component of this study was conducted by M.B.W. Prior to testing, for each of 76 trials, L. S. randomly (i) selected a target picture (a hand-drawn image randomly selected from a dictionary)[5] from four similarly derived pictures, (ii) photocopied the picture, (ii) wrapped it in aluminium foil,

formed to a two-choice standard situation" so that P_{MCE} = .50 (Rosenthal & Rubin, 1989, p. 333).

[4]Vision-impaired participants were acquired with the assistance of South Australian institutions including Townsend House, the Royal Society for the Blind, the Blind Welfare Association, Guide Dogs Association, and Radio Station 5RPH. Interstate participants were acquired with the assistance of four Victorian institutions: Blind Citizens Australia, Royal Victorian Institute for the Blind, the Deaf Blind Association, and Vision Australia Foundation.

[5]The gallery of 180 pictures used in this experiment is comprised of Thalbourne's (1981) hand-drawn originals. Randomization was achieved by using Pagano's (1986, pp. 479–480, Table J) random number tables. Each picture was randomly assigned to a four-picture set, so that there were 45 sets altogether. Each set was then assigned a number and set selection was achieved by using Pagano's (1986) Table J.

and (iv) concealed it in a target envelope. M. B. W. thus remained 'blind' to the target during each trial.

All vision-impaired participants were tested in their homes. Participants' details (age, gender, and level of blindness) were recorded. Vision-impaired participants fell into two categories: (i) blind from birth, and (ii) blind after birth.

All participants completed (1) Thalbourne's (1995) Australian Sheep-Goat Scale (ASGS), (2) the Extraversion (EX) sub-scale from the EPI (Eysenck & Eysenck, 1965); and (3) Rosenberg's (1965) Self-Esteem (S-E) Scale. The EX Scale and the S-E Scale were administered because Storm and Thalbourne (2001) argued that vision-impaired participants seemed more introverted and lower in self-esteem than sighted participants; introversion and low self-esteem being possible psi-inhibitive factors. Regarding the psi-extraversion relationship, see the meta-analysis by Honorton, Ferrari, and Bem (1998). Note also that extraversion and self-esteem tend to correlate significantly and moderately (see Robins, Tracy, & Trzesniewski, 2001). Items from both scales were read out by M. B. W. to blind participants.

Participants were then required to describe verbally the line drawing that was concealed in aluminium-foil inside the manila envelope. The experimenter M. B. W. took notes of the participant's mentations, and read them back, in order to prompt the participant's memory, thereby assisting them in the ranking process. M. B. W. did not offer personal interpretations as that might have misled participants.

Participants ranked the four pictures from 1 to 4 (1 being the 'most likely' picture concealed in the envelope, 4 being the 'least likely'). M. B. W. gave impartial assistance in the judging process by describing the pictures to the blind participants since they could not see them. All participants received a payment of AUD$20.00 for volunteering. L. S. conducted all statistical tests.

The following hypotheses are proposed (tests used are also given):[6]

1. Blind participants score higher than sighted participants using: (i) the direct-hits measure (i.e., percent correct, where MCE = 25% (ex-

[6]Note that the various measures of psi in Hypotheses 1 and 2 are conducted for comparative purposes. Initially, Storm and Thalbourne (2001) used the sum-of-ranks test, whereas the direct-hits test was post hoc. Both types of tests are again conducted in the present study merely to pursue some conjectures about how psi might manifest in blind and sighted participants. Whilst the likelihood of Type I error is increased, we let the results speak for themselves, and we leave it open-ended as to whether we found evidence for psi (see Discussion for further comments).

act binomial test, one-tailed, and t test, one-tailed), and (ii) the effect size measure π, where $\pi = \frac{P(k-1)}{[1+P(k-2)]}$ (note that π_{MCE} = .50).

2. The levels of scoring, as sum-of-ranks scores for (i) the whole sample, (ii) the blind group, and (iii) the sighted group, are lower (i.e., better) than chance (MCE = 2.50). (Test used: the sum of ordinal weighted ranks formula, one-tailed).[7]

3. There is a difference in performance between the blind and the sighted such that the mean sum-of-ranks score for the totally blind is lower (better) than the mean sum-of-ranks score for the sighted (Test used: Wilcoxon signed-ranks matched-pairs test, one-tailed).

4. Performance of sheep will be superior to goats using mean rank scores (based on a median-split division of ASGS scores). (Test used: Mann-Whitney U test, one-tailed).

5. There are negative relationships between rank-scores and (i) ASGS scores; (ii) extraversion, and (iii) self-esteem (Tests used: Spearman's rho test, one-tailed).

6. There is a positive relationship between extraversion and self-esteem (Test used: Pearson's r test).

Results

Descriptive data

Frequencies of 'hits' by ranks for each group and the whole sample are given in Table 1.

Table 1: Participants' Rank Scores: Totally Blind, Sighted, and Whole Sample

Group	Rank				Total
	1	2	3	4	
Totally Blind	8 (21.1%)	7 (18.4%)	12 (31.6%)	11 (28.9%)	38
Sighted	8 (21.1%)	12 (31.6%)	9 (23.7%)	9 (23.7%)	38
Whole Sample	*16 (21.1%)*	*19 (25.0%)*	*21 (27.6%)*	*20 (26.3%)*	*76*

[7]Level of scoring is determined from the sum-of-ranks score and the corresponding Z score. $Z = \frac{(M-U_M \pm 0.5)}{\sigma_M}$, "where M is the observed sum-of-ranks, $U_M = \frac{N(R+1)}{2}$, and $\sigma^2_M = \frac{N(R-1)}{12}$. The 0.5 is the usual continuity correction and has sign opposite to that of $(M - U_M)$" (see Solfvin, Kelly, & Burdick, 1978, p. 99). Psi-hitting is indicated by a significant sum-of-ranks score that is lower (better) than MCE = 2.50. The Z score will be *negative* because U_M is greater than M.

The mean Australian Sheep-Goat Scale (ASGS) score for the whole sample was 19.71 (*SD* = 7.07). The difference between ASGS scores for blind (M = 19.21, *SD* = 6.44) and sighted (M = 20.21, *SD* = 7.71) was tested, but the result was not significant, $t_{(74)}$ = -0.61, p = .541 (two-tailed).

The mean EX score for the whole sample was 14.03 (*SD* = .28). The difference between EX scores for blind (M = 13.76, *SD* = 4.49) and sighted (M = 14.29, *SD* = 4.12) was not significant, $t_{(74)}$ = -0.53, p = .596 (two-tailed).

The mean S-E score for the whole sample was 19.16 (*SD* = 4.29). The difference between scores for blind (M = 19.32, *SD* = 5.56) and sighted (M = 19.00, *SD* = 5.82) was not significant, $t_{(74)}$ = 0.24, p = .810 (two-tailed).

Planned analyses

Hypothesis 1: It was hypothesised that blind participants would score higher than sighted participants using the direct-hits measure as a proportion-correct, and effect size π measure. The totally blind group (with 8 hits) and the sighted group (also with 8 hits) both scored at the below-chance hit-rate of P = 21%, exact Binomial p = .769 (π = .45, z = -0.51, p = .829, right-tailed). There was no evidence that psi compensates for total blindness. Note that these two identical hit-rates indicate that the whole sample also scored at P = 21%, exact p = .822 (π = .45, z = -0.72, p = .764, right-tailed).

Hypothesis 2: It was hypothesised that the levels of scoring, as sum-of-ranks scores for (i) the whole sample, (ii) the blind group, and (iii) the sighted group, would be lower (better) than chance. The following results were obtained:

1. Whole sample: z = 0.67, p = .749 (left-tailed). The mean rank score was 2.59 (*SD* = 1.10), which was greater (i.e., worse) than chance, where MCE = 2.50.

2. Totally blind: z = 0.94, p = .826 (left-tailed). The mean rank score was 2.68 (*SD* = 1.12), which was greater (i.e., worse) than chance.

3. Sighted: z = 0.00, p = .500 (left-tailed). The mean rank score was exactly at chance 2.50 (*SD* = 1.08).

None of the results were in the expected directions, and none were significant.

Hypothesis 3: It was hypothesised that there would be a difference in performance between the blind and the sighted such that the mean rank score for the totally blind would be lower (better) than the mean rank score for the sighted. The mean rank score for the totally blind (M = 2.68) was not superior to that of sighted participants (M = 2.50). The hypothesis was not supported. Since the hypothesis is directional (one-tailed), the difference was not tested.

Hypothesis 4: It was hypothesised that the performance of sheep would be superior to goats using mean rank scores (based on a median-split division of ASGS scores). The median ASGS score was 20. Those above 20 were taken as sheep (n = 36), those below or equal to 20 were taken as goats (n = 40). Performance by sheep (M = 2.72 *SD* = 1.16) was not superior to that of goats (M = 2.48, *SD* = 1.04). The hypothesis was not supported.

Hypothesis 5: It was hypothesised that there would be negative relationships between rank-scores and (i) ASGS scores, (ii) extraversion, and (iii) self-esteem. All three relationships were positive. Relationships were also positive for the same three correlations when data for only the totally blind were used. The hypothesis was not supported.

Hypothesis 6: It was hypothesised that there would be a positive relationship between extraversion and self-esteem. The relationship was positive, and it was significant, $r_{(74)}$ = 0.23, p = .023 (one-tailed). The hypothesis was supported.

Post-hoc analyses

Performance Comparisons: Given the inferior non-significant overall performance of the sample compared to the overall significant performance of Storm and Thalbourne's (2001) sample, the mean rank scores of the two datasets were tested for homogeneity. If there is a significant difference, then the two samples were not drawn from the same population. The Mann-Whitney U test is used to test the difference. The test result was not significant, U = 2683.5, Z = -1.80, p = .072 (two-tailed). The merging of the two samples is therefore justified, given that the result suggests the samples are not heterogeneous.

Scoring on the Direct-Hits Measure: Hypothesis 1 was re-tested using the dataset from the present study (N = 76), combined with Storm and Thalbourne's (2001) dataset (N = 84: Total N = 160). Results are given in Table 2. The totally blind (23.2%) did not score higher than the sighted (27.5%). Again, no support was found for Hypothesis 1. Storm and Thalbourne (2001) initially found that the totally blind scored better than the rest of the sample. The totally blind (P = 23.2%) did not score better than the rest of the sample (i.e., sighted/partially-sighted, P = 24.0%).

Table 2: Direct-Hit Rates: Various Groups and Whole Sample

Group	N	Hits	P (%)	p	π	z	p^a
Totally Blind	56	13	23.2	.671	.47	-0.38	.648
Sighted	80	22	27.5	.343	.53	0.48	.316
Partially-Sighted	24	3	12.5	.960	.30	-0.92	.821
Sighted & Partially-Sighted datasets combined	104	25	24.0	.626	.49	-0.17	.433
Whole Sample	*160*	*38*	*23.8*	*.672*	*.48*	*-0.43*	*.666*

[a] p values for the z statistics are right-tailed.

Scoring on the Sum-of-Ranks Measure: The sum-of-ranks formula was applied to the combined datasets of Storm and Thalbourne (2001; N = 84) and the present study (N = 76) to re-test Hypotheses 2 and 3. Results are given in Table 3.

Table 3: Mean Rank Scores: Various Groups and Whole Sample

Group	Mean Rank	SD	z	p^a
Totally Blind (n = 56)	2.57	1.11	0.42	.663
Sighted (n = 80)	2.27	1.04	-1.75	.040
Partially-Sighted (n = 24)	2.63	1.01	0.46	.677
Sighted & Partially-Sighted datasets combined (n = 104)	2.36	1.04	-1.27	.102
Whole Sample (N = 160)	*2.43*	*1.07*	*-0.74*	*.230*

[a] p values are left-tailed.

Only the sighted group produced a mean rank score that was significantly lower (better) than chance, which strengthens Storm and

Thalbourne's (2001) initial finding of a significant mean rank score for sighted individuals. Hypothesis 2 was therefore partially supported.

In the case of Hypothesis 3, the mean rank score of the totally blind (M = 2.57) was not found to be superior to that of the sighted (M = 2.28). The hypothesis was not supported. Since the hypothesis is directional (one-tailed), the difference was not tested.

Discussion

Planned analyses

In the present study, the blind group's performance was not superior to that of the sighted group on the direct-hits measure. In fact, both groups got the same below-chance score of 21%, where MCE = 25%. However, using the sum-of-ranks formula, the sighted group scored a little better than the totally blind, but not significantly better, and once again, scoring was no better than chance. These results are of some concern, not because the differences were not significant, but because of the disconcerting fact that both groups scored comparatively worse than their corresponding cohorts in Storm and Thalbourne's (2001) initial study on both measures (i.e., direct hits and sum-of-ranks, see Storm & Thalbourne, 2001, pp. 151-153).

Three measures — Thalbourne's Sheep-Goat Scale, Eysenck's Extraversion scale, and Rosenberg's Self-Esteem scale — were administered to the sample to determine if rank scores could be predicted from scores on those measures. For the four tests conducted, there were no significant correlations between rank scores and any of the three measures, although (perhaps not surprisingly) extraversion correlated positively and significantly with self-esteem.

Post-hoc analyses

The situation did not improve much when using the direct-hits measure on the combined dataset (i.e., data from the present study (N = 76) plus the data from Storm and Thalbourne's study (N = 84) providing a total N = 160). For the combined sample (N = 160), direct hitting was not superior for the totally blind compared to the sighted. Direct hitting was also not superior for the totally blind group compared to the remainder of the sample (i.e., sighted/partially-sighted). The results do not lend any support to the hypothesis that total blindness is compensated by *enhanced* psi performance (i.e., psi hitting).

However, using the sum-of-ranks formula, an overall significant effect was found for the sighted group only. This result is not an entirely independent replication of the effect initially found by Storm and Thalbourne (2001) because the combined score (M = 2.27) uses high-scoring old data (i.e., Storm & Thalbourne's, 2001, data) to bolster up the exactly-at-chance score (M = 2.50) of the new sighted group. On the other hand, the result may more accurately reflect its corresponding population parameter for sighted individuals. From this result, it appears that sighted participants had an advantage over vision-impaired participants, who again scored worse than chance.

These results do not lend any support to the hypothesis that total blindness is compensated by *enhanced* psi performance (i.e., psi hitting). However, it is also true that any statement one might like to make about psi (as measured on the free-response task) for sighted individuals will depend on how conservative one thinks the psi measure should be. The direct-hits measure is said to be the most conservative (cf. Honorton, 1985), but Solfvin et al. (1978) argue that all ranks should be considered in order that partial credit be given to the other ranks.

The problem of ideal targets

In considering the alleged compensation effect in the vision-impaired, it may be the case that compensation comes in other forms other than enhanced psi performance. This alternative hypothesis can be tested in ways too numerous to mention here, but we imagine testing would focus primarily on the still-functioning modalities such as hearing and touch (see Sacks, 2003). Oliver Sacks discusses a hearing compensation effect in John Hull, who became totally blind at the age of 13. Of Hull's improved hearing, Sacks writes:

> "With his new intensity of auditory experience (or attention), along with the sharpening of his other senses, Hull comes to feel a sense of intimacy with nature, an intensity of being-in-the-world, beyond anything he knew when he was sighted. Blindness now becomes for him 'a dark, paradoxical gift.' This is not just 'compensation,' he emphasizes, but a whole new order, a new mode of human being."
>
> (Sacks, 2003)

However, our issue is with ostensibly paranormal (not normal) experience. Furthermore, to shift our focus somewhat, and in spite of our earlier statements to the contrary (cf. Gonzales-Scarano, 1982), we now find ourselves in a quandary over target suitability. It is possible that hand-drawn pictures may, in some way, facilitate the psi process more effectively in sighted individuals simply because they can visually scan and contemplate the four-choice array of drawings in front of them, thus triggering unconscious psychic processes that may subsequently result in a psi effect. The post hoc sum-of-ranks results suggest that this is the case for sighted individuals. Clearly, the totally blind may well be disadvantaged if vision is conducive to the psi process. Thus, we ask the question, What constitutes an ideal target given a participant's disability? It is still true that totally blind people may find it difficult to relate to the idea of a picture-target drawn on a piece of paper, in the sense that such targets are outside their normal day-to-day experiences, and this is especially true for individuals who are totally blind from birth. In the case of John Hull, for example, images and the very idea of seeing (the appearance and concept of an object once known to him) was lost forever over time: it was as if Hull had been blind his whole life (Sacks, 2003).

Broughton (1976) has pointed out that there may be target preferences amongst participants, dependent upon their natural inclinations and dispositions. For example, they might prefer three-dimensional or textured targets made of wood or other material. Broughton used five three-dimensional targets comparable to the five Zener cards in a design where participants used either their left or right hands to select the shape that 'felt correct'. Other possible tests for blind participants might include musical notes or sound segments (cf. Willin, 1996), taste recognition, and odour discrimination (cf. Stahl, 2004). It seems to us, however, that targets of this nature, and contact with those targets, would be psi-conducive during the ranking stage more than anything else if we are to assume that the psi process is democratic. After all, surely the blind person should not be allowed to make tactile contact with the target set during the mentation stage; the sighted person is never given a similar advantage since the four pictures are concealed in an envelope until the ranking stage.

We must also consider whether giving totally blind people a sensory advantage does not in itself give sighted people a disadvantage. Just as there is differential functioning between the hemispheres of the brain such that a person with left-brain dominance may prefer language-based targets (e.g., words, phrases, sentences) or sequential targets (e.g., ordered pattern changes), a person with right-brain dominance may prefer visual or pictorial targets. Clearly, our aim would be to devise targets that are neutral across the comparison groups.

As it stands, our findings may still be important if we have discovered something new about how the psi function might work. Not only should target suitability be a consideration when conducting experiments of this kind, but also we must recognise that all participants are not born equal, such that the psi function (insofar as it may be 'gestalt' in nature) may not necessarily be a democratic process *if its function is partially dependent on one or more normal sensory modalities*.[8]

Conclusion

For the new data, it was shown that the totally blind and the sighted are equally matched performance-wise in the picture-identifying task: scoring was at chance for both groups (i.e., no psi effects were found). Thus, there were no replications of Storm and Thalbourne's earlier findings. However, for the combined dataset, while only chance scoring was indicated in the vision-impaired groups, psi hitting *was* demonstrated in the sighted group. It appears that vision-impairment is not conducive to psi hitting. We argue that it is reasonable to assume that if there is compensation for vision-impairment, it might work in ways other than paranormal, but until tests are conducted using alternative targets that are preferable to both groups — sighted and vision-impaired — we are still not in a position to make inferences about psi compensation for modality impairment: specifically, total blindness.

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[8]We acknowledge that the second referee of the present article made similar criticisms of our research. However, we are not just pointing out putative deficits in our study for the mere sake of it. We are trying to bring attention to a possible differential psi effect that may be governed by at least two factors: (i) the nature of the target, and (ii) how the target is mediated during the ranking stage.

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