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Latent structure of the Test of Everyday Attention in a non-clinical Chinese sample☆

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Abstract

The validity and clinical viability of Posner and Petersen's (1999) 3-factor model of attention was tested through a confirmatory factor analysis of attentional performance (Test of Everyday Attention [Robertson, I. H., Ward, T., Ridgeway, V., & Nimmo-Smith, I. (1996). The structure of normal human attention: The Test of Everyday Attention. *Journal of the International Neuropsychological Society*, *2*, 525–534]) in a sample of 133 Chinese participants. This study served both as a cross-cultural replication of the clinical implementation of this leading theoretical model of attention, and as a more stringent test of the validity of the hypothesized attentional processes underlying human cognitive control. The results support the validity of a 3-factor model of attention consistent with that proposed by Posner and Petersen (selective attention, sustained attention, and attentional switching/control), and demonstrate that clinical assessment of neuroanatomically-distinct attentional processes using simulated real life activities is possible.

Keywords: Attention; Confirmatory factor analysis

1. Introduction

Research over the last 2 decades on the neuropsychology of attention suggests that attention may be subserved by several semi-independent, anatomically distinct, and supramodal control systems (Posner & Petersen, 1990). A number of behavioral studies have sought to identify distinctions between systems of attention in both healthy and clinical populations (Chan, 2001, 2002; Chan, Hoosain, Lee, Fan, & Fong, 2003; Manly, Robertson, Anderson, & Nimmo-Smith, 2001; Mirsky, Anthony, Duncan, Aheam, & Kellam, 1991; Posner & Petersen, 1990; Sohlberg & Mateer, 1989, 2001; Stuss & Benson, 1986; Van Zomeren & Brouwer, 1994), variously called components, elements, or systems (e.g., Mirsky et al., 1991; Van Zomeren & Brouwer, 1994). Another source to support distinctions of attention comes from

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intervention studies. For example, treatment efficacy studies (Chan, Hoosain, & Lee, 2002; Sohlberg, McLaughlin, Pavese, Heidrich, & Posner, 2000; Sturm, Willmes, Orgass, & Hartje, 1997) showed that different aspects of attention responded differentially to attention intervention. However, there is no clear consensus on whether these systems should be identified by experimental or behavioural tests of attention.

One main reason for this confusion and interpretation of the relationships among tests is the assessment of attention by different methodologies. Typically, correlational methods involve exploratory factor analysis or principal component analysis (e.g. Mirsky et al., 1991; Sohlberg & Mateer, 1989, 2001) to compare many tasks of attention and to adduce underlying attentional constructs. Such studies, however, suffer because of the essentially post hoc nature of such correlational methods, with the consequent possibility that the factors emerging may be specific to a particular population rather than generalisable to a range of populations.

The Test of Everyday Attention (1996) has been subject to a number of such correlational analyses, yielding factor structures that while having a very strong overlap, also had some differences (see below). The children's equivalent of this test, the Test of Everyday Attention for Children (TEAch; Manly, Robertson, Anderson, & Nimmo-Smith, 1999; Manly et al., 2001) Strauss, Thompson, Adams, Redline, and Burant (2000) for instance, used CFA to test the validity of a structure of attention proposed by Mirsky et al. (1991) based on a set of commonly used clinical tests; these factors were focus-execute, sustained attention, shift, and encode. Strauss et al. (2000) could not replicate Mirsky et al.'s findings by using exactly the same set of attentional tests in another clinical group. While Mirsky's model was derived from a principal components analysis of attentional test performance, Posner and Petersen (1990)'s model was based on a range of neuropharmacological, neuroimaging, and experimental psychological studies and thus had a much stronger theoretical, conceptual, and empirical base than Mirsky's post hoc model. Posner and Petersen propos the existence of three separate supramodal attention systems. An anterior sub-system located in the prefrontal cortex and anterior cingulate regions is responsible for attentional control and selection from among competing responses and cognitive sets; Posner and Raichle (1994) propose that this system is linked particularly to the dopaminergic system. A posterior sub-system located mainly in the posterior parietal lobe, the lateral pulvinar nucleus of the thalamus, and the superior colliculus is responsible for the orientation of attention in space and the consequent attentional selection from among competing stimuli, objects and locations; Posner (ref) proposes that this selection/orientation system is linked to the cholinergic system. Finally, the vigilance or alertness sub-system is responsible for maintaining readiness to respond in the absence of external cues; this right fronto-parietal system is proposed to have particular links with the noradrenergic system.

1.1. The Test of Everyday Attention

Robertson, Ward, Ridgeway, and Nimmo-Smith (1994, 1996) developed the Test of Everyday Attention (TEA) for a comprehensive assessment of attention performance in patients with specific attentional deficits. This test has several advantages over conventional measures of attention. Firstly, it is one of the few identified tests of attention that simulates everyday life tasks. The tasks incorporated into the TEA tended to be more relevant to everyday life activities as compared to laboratory-based tests of attention. Secondly, it is a relatively comprehensive test, comprising a wide range of test items, capturing different aspects of attention, e.g., sustained attention, divided attention and attentional switching. Thirdly, the TEA is one of the very few tests that were developed from a theoretical framework of attention. The TEA leans heavily on Posner and Petersen's (1990) of attention. The TEA has three parallel versions, each with eight sub-tests. The whole test is based on the imaginary scenario of a vacation trip to the Philadelphia area of the United States. The test–retest reliability of the test items has been reported to be sufficient (correlation coefficient ranges from 0.61 to 0.9). Moreover, all the test items were able to discriminate stroke cases from healthy controls (Robertson et al., 1994, 1996).

Despite the potential benefits of the TEA over other tests of attention, there have been relatively few studies specifically examining the factor structure embedded within this test. Robertson et al. (1996) derived a 4-factor model of attention among a group of healthy participants ($n = 155$) using the principal component analysis. The factors were identified as visual selective attention/speed (Map Search, Telephone Search), attentional switching (Visual Elevator), sustained attention (Lottery Test, Elevator Counting; Dual Task Decrement), and auditory–verbal working memory (Auditory Elevator with Reversal, Auditory Elevator with Distraction).

Recently, the test has been applied in a Hong Kong Chinese setting (Chan, 2000; Chan et al., 2002; Chan, Hoosain et al., 2003; Chan, Lee, & Hoosain, 1999; Chan, Robertson, & Crawford, 2003). Chan et al. (2002) replicated a

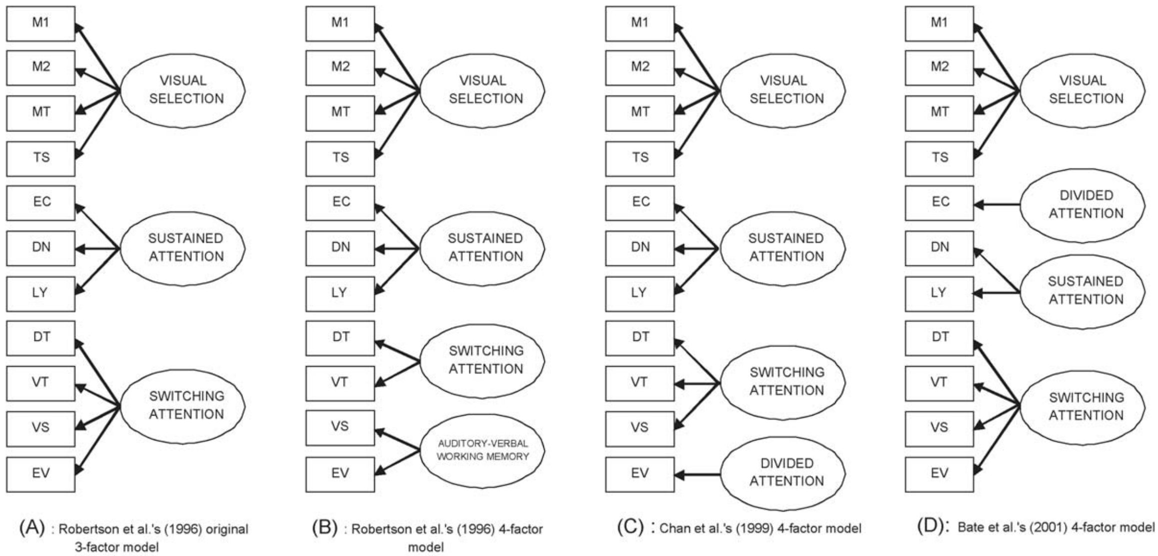

Fig. 1. Testing models of attentional components of the TEA. M1: Map Search in 1 min; M2: Map Search in 2 min; MT: Map Search Total; TS: Telephone Search; EC: Elevator Counting; DN: Dual Task Decrement – Telephone Search While Counting; LY: Lottery Task – Lottery in Digits Raw Score; DT: Elevator Counting with Distraction; VT: Visual Elevator Raw Score – Reaction Time; VS: Visual Elevator Time Score – Switch; EV: Elevator Counting with Reversal.

similar 4-factor model among a group of neurologically healthy Hong Kong Chinese ($n = 49$)—selective attention (Map Search, Telephone Search, Elevator Counting with Reversal), sustained attention (Lottery, Elevator Counting), attentional switching (Visual Elevator, Elevator Counting with Distraction), and divided attention (Telephone Search While Counting). The main difference yielded in Chan et al.'s (2002) study was the fourth factor, namely divided attention, as compared with Robertson et al.'s (1996) auditory–verbal working memory. In Chan et al.'s factor solution, auditory elevator reversal and auditory elevator with distraction were loaded on selective attention and attentional switching factor respectively. This factor structure was later replicated by Bate, Mathias, and Crawford (2001) in a mixed group of normal and patients with severe traumatic brain injury ($n = 70$). However, the sub-tests loaded on these factors were somewhat different from those of Chan et al.'s study. In Bate et al.'s model, Elevator Counting went to divided attention, whereas Elevator Counting with Reversal belonged to attentional switching. The notable differences might be due to the combination of normal and patients in Bate et al.'s study. In addition, the Cantonese version of Chan et al.'s study as well as the modification of the Lottery sub-test might limit a direct comparison of these results.Besides Robertson et al's study, the other two studies mentioned above were limited by the small "subject to variable" ratio (less than the standard 10:1 ratio) (Hair, Anderson, Tatham, & Black, 1998). Furthermore, all of these studies employed the method of principal component analysis (PCA). As mentioned earlier, although PCA is a useful method for reducing data into several principal components, it is not the best method to test whether the factor solution has a reasonable fit with a theoretical model or to estimate the extent to which factor structures are similar across samples (Bentler, 1990; Hair et al., 1998; Toit, Toit, Joreskog, & Sorbom, 1999).

1.2. The present study

In the present study, we used confirmatory factor analysis to test four alternative models of attention structure of the well-validated ecological test of attention from the correlational attention literature. Fig. 1 summarizes the testing models for the TEA. The models compared include one 3-factor model (visual selection, sustained attention, and switching), and three 4-factor models from Robertson et al. (1996) (sustained attention, selective attention, attention switching, and auditory–verbal working memory), from Chan et al. (1999, 2002) (visual selection, sustained attention, switching, and divided attention), and Bate et al. (2001) (same as Chan et al., 1999, 2002).

2. Methods

2.1. Participants

The sample consisted of 133 (72 women and 61 men) healthy adults whose age ranged from 17 to 51 years with a mean age of 34.07 years (S.D. = 10.45). They were selected from a pool of volunteers from an extensive local norms project on neuropsychological test performance in Hong Kong by the first author. The education level ranged from 8 to 17 years (mean = 11.35; S.D. = 3.09). All were Cantonese-speaking Chinese. Participants were screened by trained research assistants using a semi-structured interview to ensure that they did not suffer from any closed head injury, central nervous system diseases, or other physical or mental illnesses.

2.2. Procedures

Each participant was given a full battery of the TEA according to the instruction manual (Robertson et al., 1994). All participants were given Version A of the Cantonese translated test. The participants were asked to perform eight sub-tests of everyday tasks in different scenarios that have been described in details elsewhere (Chan et al., 1999, 2002, 2003; Robertson et al., 1996). In brief, the eight sub-tests were as follows:

1. *Map Search*: Participants searched for symbols, e.g. for a knife-and-fork sign representing eating facilities, on a colored map of the Philadelphia area. The score was the number out of 80 found in 2 min.
2. *Elevator Counting*: Participants were requested to pretend they were in an elevator whose floor indicator was not functioning. They were asked to establish which "floor" they had arrived at by counting a series of tape-presented tones.
3. *Elevator Counting with Distraction*: Participants were asked to count the low tones in the imaginary elevator while ignoring the high tones.
4. *Visual Elevator*: Participants were asked to count up and down as they followed a series of visually presented "floors" in the elevator. It was a self-paced task. The scores were the number of correct responses and the time-per-switch (switch refers to how the elevator switches from going up to going down and vice versa) measure derived from the test.
5. *Elevator with Reversal*: This test was similar to that of visual elevator sub-test except that it was presented to the participants at a fixed speed on audio tape.
6. *Telephone Search*: Participants were asked to look for key symbols while searching for plumbers (or restaurants in Version B) in this simulated telephone directory.
7. *Telephone Search Dual Task*: Participants were asked to search in the telephone directory, while simultaneously counting strings of tones presented by a tape recorder. The performance in Test 7 and Test 6 was combined to give a measure of divided attention—a "Dual Task Decrement".
8. *Lottery*: Participants were asked to listen to their winning number in a lottery list, which they knew ended in "55". They had to listen to a 10-min series of tape-presented numbers of the form "BC143", "LD967", and so forth. For the Cantonese version, the task involved writing down the two letters preceding all numbers ending in "55", of which there would be 10 in 10 min.

3. Data analysis

Factor structures of TEA proposed by different researchers were tested with CFA using LISREL 8.30 for Windows (Jöreskog & Sörbom, 1999). Both exploratory and confirmatory factor analysis aim to investigate factor structure embedded in the dataset but CFA allows researchers to confirm a predetermined factor structure by fixing particular factor loadings at zero and also the estimation of correlations between latent factors (cf. Kline, 1998). Monte Carlo estimates of sample size requirements for confirmatory factor analysis and structural equation modeling suggest that a sample size between 100 and 200 would be adequate for the relatively simple models that were to be estimated in this study (Tanaka, 1987).

In LISREL models, the differences between the sample covariance matrix and the covariance matrix generated by the hypothesized model were minimized through maximum likelihood estimation. The degree of lack of good fit in a model was assessed through the application of a chi-square test on the degree of discrepancy between the two covariance matrices. Since the chi-square test is very sensitive to sample size and the probability of rejecting any model increases as the sample size increases even when the model is minimally false (Bentler, 1990). Other fit indices were recommended in parallel with the chi-square test to assess the goodness of fit of CFA models (Hair et al., 1998; Hu & Bentler, 1999). We used the goodness of fit index (GFI) and the comparative fit index (CFI) to assess the four competing models and GFI and CFI scores of 0.90 or higher (Hair et al., 1998) or close to 0.95 (Hu & Bentler, 1999) were considered evidence of good fit. The standardized root mean square residual (SRMR) was also used to indicate the average size of the absolute standardized differences between the sample and estimated matrices, with a score of less than 0.08 to be considered evidence of good fit in the present study (Toit et al., 1999).

4. Results

Table 1 summarizes the mean scores of the eight sub-tests of the TEA. Ceiling effect was observed in Elevator Counting (EC) with a mean score of 6.96 (S.D. = 0.53) out of a maximum of 7. Table 2 presents results of the intercorrelations of sub-tests of the TEA. The correlation matrix was not positive definite and Map Search in the 2 min was identified to be the cause of this problem and therefore was excluded in the modeling. In this sample, EC did not correlate with other variables, which might be due to the ceiling effect, and was excluded in the modeling. Bate et al.'s 4-factor model relies solely on EC to represent the divided attention factor and therefore could not be tested in this study. We assumed, as other researchers, that correlations between variables should be explained by

Table 1
Performance on TEA in healthy participants

Sub-test performance ($N = 133$)	Mean/n	S.D. (%)
Map Search 1	48.56	9.93
Map Search in the 2 min	24.72	7.61
Map Search Total	73.28	4.81
Telephone Search	2.60	0.43
Elevator Counting	6.96	0.53
Telephone Search While Counting	1.13	1.54
Lottery in Digits Raw Score	9.79	0.46
Elevator Counting with Distraction	8.53	1.56
Visual Elevator Raw Score	8.86	1.05
Visual Elevator Time Score	3.27	0.97
Elevator Counting with Reversal	7.20	2.23

Table 2
Correlation of TEA items

Sub-tests	M1	M2	MT	TT	ET	DN	LY	DT	VT	VS	EV
M1	1										
M2	−0.88**	1									
MT	0.67**	−0.24**	1								
TT	−0.53**	0.41**	−0.44**	1							
ET	0.07	−0.04	0.08	−0.16	1						
DN	−0.23**	0.11	−0.30**	0.18*	0.00	1					
LY	0.20*	−0.10	0.25**	−0.06	−0.03	−0.10	1				
DT	0.30**	−0.19*	0.31**	−0.30**	−0.05	−0.17	0.28**	1			
VT	0.08	0.06	0.26**	−0.16	0.11	−0.12	0.09	0.19*	1		
VS	−0.43**	0.28**	−0.45**	0.54**	0.01	0.21*	−0.14	−0.35**	−0.28**	1	
EV	0.40**	-0.22*	0.48**	−0.39**	0.03	−0.28**	0.16	0.59**	0.23**	−0.63**	1

M1: Map Search in 1 min; M2: Map Search in 2 min; MT: Map Search Total; TS: Telephone Search; EC: Elevator Counting; DN: Dual Task Decrement – Telephone Search While Counting; LY: Lottery Task – Lottery in Digits Raw Score; DT: Elevator Counting with Distraction; VT: Visual Elevator Raw Score – Reaction Time; VS: Visual Elevator Time Score – Switch; EV: Elevator Counting with Reversal.

* $p < 0.05$.

** $p < 0.01$.

Table 3
Factor loadings and goodness of fit indices of competing CFA models in healthy participants

Sub-test	Single factor model	Robertson et al.'s 3-factor model	Robertson et al.'s 4-factor model	Chan et al.'s 4-factor model
Map Search 1	0.69	0.81[a]	0.81[a]	0.81[a]
Map Search Total	0.72	0.81[a]	0.81[a]	0.81[a]
Telephone Search	−0.63	−0.61[a]	−0.61[a]	−0.62[a]
Telephone Search While Counting	−0.35	0.37[b]	0.33[b]	0.36[b]
Lottery in Digits Raw Score	0.26	−0.28[b]	−0.31[b]	−0.28[b]
Elevator Counting with Distraction	0.55	0.63[c]	0.64[c]	0.59[c]
Visual Elevator Raw Score	0.30	0.30[c]	0.30[c]	0.25[c]
Visual Elevator Time Score	−0.72	−0.72[c]	0.72[d]	−0.67[c]
Elevator Counting with Reversal	0.74	0.87[c]	−0.87[d]	1.00[e]
Chi-square	86.01	50.61	48.44	45.44
d.f.	27	24	21	22
p for chi-square	0.0000	0.0012	0.0006	0.0023
SRMR	0.06764	0.05809	0.05695	0.05556
GFI	0.88	0.93	0.93	0.93
CFI	0.82	0.92	0.92	0.93

Notes: All factor loadings were significant at 0.05 level. Items of Map Search in 2 min and Elevator Counting were not included in the model computations.
[a] Visual selection.
[b] Sustained attention.
[c] Switching attention.
[d] Auditory–verbal working memory.
[e] Divided attention.

the latent factors in the models and tested the models with uncorrelated observed variables (Jöreskog & Sörbom, 1999).

Table 3 displays the results of the confirmatory factor analysis for each of the three competing models, as well as the single factor model, in healthy participants. It can be seen that, Robertson et al.'s 3-factor model ($\chi^2(33) = 50.61$, $p < 0.01$, GFI = 0.93, CFI = 0.92, SRMR = 0.06), Robertson et al.'s 4-factor model ($\chi^2(21) = 48.44$, $p < 0.01$, GFI = 0.92, CFI = 0.92, SRMR = 0.06), and Chan et al.'s 4-factor model ($\chi^2(22) = 45.44$, $p < 0.01$, GFI = 0.93, CFI = 0.93, SRMR = 0.06) fitted the data satisfactory as indicated by all indices of goodness of fit (GFI and CFI close to 0.95 and SRMR < 0.08).

Factor loadings for the three competing models were all significant ($p < 0.05$). Indicators for the latent factor of visual selection showed loadings of value between 0.61 and 0.81. Indicators for switching attention also performed well, with factor loadings ranged from 0.59 to 0.87, except for the indicator Elevator Counting with Reversal, which produced factor loadings of 0.25–0.30. Factor loadings for sustained attention, though significant, were also small (value between 0.28 and 0.37) suggesting poorer performance as indicators for this latent factor.

Correlations between latent factors were all significant ($p < 0.05$). In Robertson et al.'s 3-factor model, the correlation coefficients between visual selection and sustained attention, between visual selection and switching attention, and between sustained attention and switching attention were −0.90, 0.68, and −0.83 respectively. The problem of a non-positive definite PHI matrix, which is the correlation matrix among latent factors, was identified in Robertson et al.'s 4-factor model and Chan et al.'s 4-factor model, suggesting one or more latent factors had correlation coefficients very close to 1 or −1. The value of the correlation coefficients were above 0.95 between sustained attention and switching attention and between switching attention and auditory–verbal working memory in Robertson et al.'s 4-factor model, and between sustained attention and switching attention and between switching attention and divided attention in Chan et al.'s 4-factor model.

The problem of a non-positive definite PHI matrix was not found in Robertson et al.'s 3-factor model. However, the correlation coefficient between visual selection and sustained attention was fixed at 1 in order to test if the two latent factors were independent. No significant difference was found between the two versions of Robertson et al.'s 3-factor model by a chi-square different test on the nested model ($\chi^2(1) = 0.06$, $p > 0.05$). The three competing models, namely Robertson et al.'s 3-factor model, Robertson et al.'s 4-factor model, and Chan et al.'s 4-factor model, produced

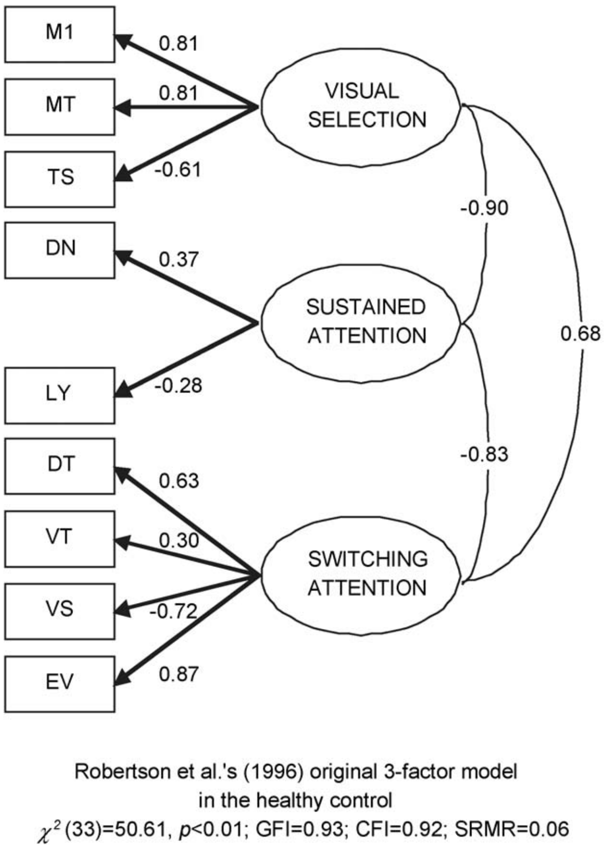

Fig. 2. Final models of attentional components of the TEA. M1: Map Search in 1 min; M2: Map Search in 2 min; MT: Map Search Total; TS: Telephone Search; EC: Elevator Counting; DN: Dual Task Decrement – Telephone Search While Counting; LY: Lottery Task – Lottery in Digits Raw Score; DT: Elevator Counting with Distraction; VT: Visual Elevator Raw Score – Reaction Time; VS: Visual Elevator Time Score – Switch; EV: Elevator Counting with Reversal.

comparable fit to the data. However, the fit indices of these models are marginally satisfied the conventional cut-offs and more important, the significant chi-square statistics suggested there were still considerable mis-fit in the model. The latent factors of visual selection and sustained attention produced a correlation with absolute value of about 0.90. Items of these two factors were thought to be manifested by a single factor and a 2-factor model based on this idea produced similar fit to Robertson et al.'s 3-factor model. Although Robertson et al.'s 3-factor model has strong theoretical framework, the other models, including the 2-factor model, are potential competitors in explaining attention components in the Chinese normal population. Further studies with larger sample sizes of the Chinese population are needed. Taken together, there should be three types of attention based on the eight tasks of the TEA because Robertson et al.'s 3-factor model is the most parsimonious model among the others (Fig. 2).

5. Discussion

The present findings support the validity of Posner and Petersen's model of human attention and show that the three proposed attentional sub-systems—visual selective attention, vigilance/sustained attention, and attentional control/switching can be measured separately and validly using simulated real life tasks in the Test of Everyday Attention. The results tend to support that a this 3-factor model is the best conceptualization of the interrelationships underlying the sub-tests of the TEA and they are also consistent with previous studies with both behavioural data and experimental data using neuroimaging techniques (Cohen et al., 1988; Pardo, Fox, & Raichle, 1991; Wilkins, Shallice, & McCarthy, 1987; Yamaguchi, Tsuchiya, & Kobayashi, 1994).

The discrepancy found among the present study and previous studies on TEA may be due to the different methodologies adopted. As noted above, previous studies of the 4-factor model used principal component analysis. Although principal component analysis may be useful for descriptive purposes, it is not stringent enough to identify or validate hypothetical constructs posited to account for relations among measured variables (e.g. Floyd & Widamen, 1995). The confirmatory factor analysis allows more direct tests of hypotheses about the fit of a conceptual model to observations than do exploratory factor analysis. Given the unique properties of confirmatory factor analysis, failures to confirm previous exploratory-based models are not uncommon.

It should be noted, however, that the Chan et al.'s 4-factor (visual selection, sustained attention, switching, and auditory–verbal working memory) also provides a good fit in the healthy sample relatively well, and is a close competitor of the final model of visual selection, sustained attention, and switching. Nevertheless, the final model provides the best fit. In addition, the 3-factor model provides support for a priori 3-factor model of the development of the test. Therefore, we believe that acceptance of the Robertson et al.'s 3-factor model may provide a parsimonious and the "best" model evaluated in this study.

More recently, Manly et al. (2001) demonstrated the same 3-factor structure in the children version of the TEA (TEA-CH) among a group of 293 healthy children between the ages of 6 and 16 years. These were selective attention (Sky Search, Map Mission), attentional control/switching (Creature Counting, Opposite World), and sustained attention (Score, Code Transmission, Walk Don't Walk, Score DT, and Sky Search DT). Again, these findings suggest a convergent validity on the construct of the Test of Everyday Attention. These latent constructs seem to be stable across the human life-span. We also did a post hoc analysis on the original UK sample using the same testing models and found the same 3-factor model fit the data best. The present findings are also consistent with the children version of the TEA (TEA-CH) (Manly et al., 2001) among a group of primary-grade healthy children. Manly et al. (1999, 2001) had demonstrated a 3-factor model of attention—selective attention (Sky Search, Map Mission), attentional control/switching (Creature Counting, Opposite World), and sustained attention (Score, Code Transmission, Walk Don't Walk, Score DT, and Sky Search DT).

There were three sub-tests that were relatively weak markers of the three factors for the models identified in the present study. This may have been due to the small variation of the performance within the present sample of healthy participants. The two tasks in sustained attention, i.e., Elevator Counting, Lottery, and the Visual Elevator may have a reduced variance due to the relative ease for healthy participants in completing them, at least in the present sample.

However, we did not include a clinical sample for cross-validation in the present study. Since the uses of TEA with normal population are not as common as with patients with neurological disorders, we need to be careful when directly applying this factor structure to TBI cases or other clinical samples. However, a very similar 3-factor structure of the Chinese version of TEA, i.e., visual selection, sustained attention, and switching attention, has been demonstrated in a Chinese sample with TBI (Chan & Lai, 2006). These findings indicate that the 3-factor model of TEA seems to be quite stable across cultures and clinical groups. Although factorial validity alone is not a sufficient indicator of the cultural equivalence of neuropsychological tests, the present findings provide convergent support for the psychometric equivalence of the factor structure of the TEA among populations of a diverse cultural and linguistic background. Future research should examine the stability of these latent structures of attention in different ethnic and clinical groups. We hope that a cross-cultural data pool can be established in the near future so that clinicians can easily and quickly refer to their client's performance by checking the adjusted cross-cultural norm measures.

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