PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Normative visual acuity in Chinese preschoolers aged 36 to < 48 months as measured with the linear HOTV chart: the Yuhuatai Pediatric Eye Disease Study
AUTHORS	Zhu, Hui; Huang, Dan; Sun, Qigang; Ding, Hui; Bai, Jing; Chen, Ji; Chen, Xuejuan; Wang, Yue; Zhang, Xiaohan; Wang, Jing; Li, Xinying; Liu, Hu

VERSION 1 - REVIEW

REVIEWER	Hua Zhong The First Affiliated Hospital of Kunming Medical University, China
REVIEW RETURNED	22-Jan-2017

GENERAL COMMENTS	Zhu et al conducted an interesting study to document population-based normative data for uncorrected visual acuity (UCVA) in Chinese preschoolers aged 36 to < 48 months. I have a few concerns: 1. The study sample was drawn from all the age-matched Childrens in Yuhuatai District or part of it? How about the sample representativeness? 2. Is there a quantitative standard for the definition of the reference population? 3. In many studies, cycloplegic refraction was performed in all subjects. However in present study, it is performed only under certain conditions. What is the reason for this? 4. Table 1 and table 2 is not necessary. The results could be replaced by words.

REVIEWER	Nicola Anstice School of Optometry and Vision Science The University of Auckland New Zealand
REVIEW RETURNED	27-Jan-2017

GENERAL COMMENTS	This is an interesting and generally well written manuscript which addresses the importance of population and chart specific guidelines for the measurement of acuity in paediatric populations. As the authors note in the manuscript the detection of amblyopia is an important consideration for all preschool screening programmes and identifying appropriate referral cutoffs to ensure high sensitivity and reasonable specificity in specific populations is a valuable contribution to the literature. Specific comments:

	1. Line 93 - is 'ocular position' the same as 'ocular alignment' i.e. the presence or absence of strabismus? 2. Line 94 - replace 'rule' with 'role' 3. Lines 111-119 - please could the authors provide more detail on how they used the handheld HOTV chart to determine UCVA in children. Did they show one letter on each line initially until and incorrect response? I am familiar with the ATS protocol used on computerized acuity charts but not familiar with how this would be adapted for a handheld chart. 4. In Table 4 the authors present results from their multivariate linear regression which identified that age had a significant effect on UCVA, that is UCVA improved with increasing age ($p < 0.0001$). However, it is interesting to note that the difference between UCVA in the 36-42 month old children is only 0.01 logMAR worse than the 42-48 month old children. This equate to less than one letter on a logMAR chart and some comment in the discussion about the clinical relevance of this would be good. 5. In Table 5 prematurity comes out as the only variable that is associated with poorer UCVA. However, the r-squared value is small. Some comment on the significance of this in the discussion would be useful. 6. Line 289: replace 'hided' with 'hid' 7. Line 298: delete 'that' before 'young children' 8. Line 299: replace 'difficulty' with 'difficult'

REVIEWER	Jody Leone University of Technology Sydney Australia
REVIEW RETURNED	31-Jan-2017

GENERAL COMMENTS	Study Design will not adequately detect all hyperopic refractive errors to be able to label the reference group as a normative group. However, they have done their best to capture as many children as possible to ensure that most children will be captured with the normative group. They have detailed this impact in the discussion. Are the methods described sufficiently to allow the study to be repeated? Further information needs to be included in the paper to detail how endpoint threshold was determined as the increments are per line. Which specific vision chart was used including a part number or include a figure of the vision chart. What illumination was used, and how this was controlled for within the study. Fundus examination of the non-cycloplegic children needs to be described. **Review of: Normative visual acuity in Chinese preschoolers aged 36 to < 48 months as measured with the linear HOTV chart** This was a very well written article with important ethnicity specific age normative values for vision testing in preschool children. Whilst the study did not perform cycloplegia on all children, the selection of the reference group and selection of those that cycloplegia was performed on was quite rigorous, and as such potentially only a select group of actual hyperopia cases may have been missed, as such my comments below reflect how this would have impacted the

	results. Line 9: Spelling mistake: “Depsrtment” should be Department Line 76: could also add Leone[1] as a reference to your point too there, as VA differences in ethnicity was also found in that study. Line 106: Change “parent” to parent/s (which can incorporate one or both parents) Line 108: Consider removing “and so on” and replace with any other significant questions that were included in the questionnaire or remove “and so on” completely. Line 110: was the fundus evaluation performed on all children or only those that were dilated? Was it performed un-dilated on the children that were not dilated? Line 112: Which vision chart was selected? Please indicate the GOOD-LITE part number or catalogue number of the vision chart. Consider including a picture of the vision chart used. Was the chart used with a backlight box, or was it illuminated with room illumination only? If room illumination only was used to illuminate the chart, was the minimum illumination of 400-600lux achieved[2]? How was minimum illumination measured and controlled for? Line 115: Methodology of determining the threshold of vision using the linear HOTV chart needs further explanation. How was the identification of each letter that the child needed to match conveyed to the child. Was it expressed in words (whilst avoiding pointing to the chart)? Or was each individual letter pointed out to the child with the examiners finger or a pointer? Perhaps was an occluder used to block out other lines either above or below the chart to assist the young child with locating which letter they need to identify? Which letter was selected for the initial screening and reinforcement phase? A central letter or a letter on the side of the chart, or were various random letters chosen on each line? Line 117/118: As VA was recorded in 0.1logMAR increments, how was the end point of visual acuity calculated? For example, if 2 letters were missed on the threshold line was it still recorded at that threshold level? or was it a full line of letters had to be achieved to be recorded as the threshold? If 3 or more letters were missed on a line was it then the previous line was used as threshold calculated? This will impact the results that were reported[3]. Line 125/127: used the value (2) twice, on line 127 will need to change “(2)” to “(3)” and “(3)” to “(4)” Line 166: grammar error: replace “than” with “then” Line 237: mention that tumbling E is “harder” this term can be

	ambiguous, consider adding “harder cognitively for the child to understand and thus affect the threshold acuity that can be achieved by the child.” Line 245: add respectively to: (0.19 vs. 0.17 logMAR) Line 253: state how the linear HOTV is different to the ATS HOTV (ATS HOTV uses a single letter surrounded by Bars ½ the letter width from the optotype). Line 252: The study mentions that “However, the significances of such comparisons are not very clear” Further explanation should be added as there is available evidence for the reasons for differences found. I have suggested a few here, and they could be added, in a shortened form within your discussion. ATS HOTV (MEPEDS) gave similar VA to your study, whereas the SPEDS[1] study found better VA by approximately 1 line (using the ATS HOTV single surrounded) when compared to this study of the YPEDS children. This may be due to methodology, as cycloplegia was performed on all children in SPEDS and MEPEDS vs cycloplegia on selected suspected children for YPEDS. The most likely group to be missed in due to this methodology is any children with moderate to high levels of hyperopia, due to accommodative reserves of these children.[4,5] Fotedor[4] and Leone[5] and a few others have found than non-cycloplegic refraction will underdiagnose any children with hyperopia due to accommodative reserves. This may produce a proportion of children with slightly reduced VA in the population due to hyperopia, thus possibly affecting the mean VA of your reference population, but the VA of this group was not reduced enough to cause them to be excluded and to elicit a response to perform a cycloplegic refraction. Another reason could be due to ATS HOTV being a single surrounded test and the ATS HOTV is cognitively easier to perform by pre-schoolers than the linear chart[6], thus ATS HOTV shows improved values for VA by 1 line, and explains why YPEDS has found a lowered VA by 1 line when compared to SPEDS, as YPEDS study has used the Linear chart to do visual acuity. In addition, ethnicity differences between studies could also be a cause of the differences. Specifically SPEDS[1] found that East Asian children had significantly poorer VA than their European Caucasian counterparts. In the SPEDS study this equated to 1-2 letters difference, and may have impacted your findings when compared to other studies findings. The introduction mentions these differences too. Methodology of SPEDS included a retroilluminated chart when testing HOTV and ETDRS linear acuity. The methodology of YPEDS is ambiguous as to what level of illumination was used during vision testing (as indicated this needs to be discussed in the methodology), and if the illumination was not controlled (below 400 lux) or was not

retroilluminated, this may have impacted the results found.[2]

	YPEDS (Zhu)	MEPEDS	SPEDS	SPEDS
n	791	460	109+127 (36-48m)	
	HOTV Linear	ATS HOTV(Single surrounded HOTV)	ATS HOTV (Single surrounded HOTV)	HOTV linear or ETDRS Linear
Cycloplegia	Selective	All children	All children	All children
Ethnicity	Chinese	African American /Hispanic children	European Caucasian and Asian	European Caucasian and Asian
36-<42 m	0.19 logMAR	0.17 logMAR (36-48m)	0.09 logMAR	0.22 logMAR
42-<48m	0.18 LogMAR		0.07 logMAR	0.16 logMAR

Line 252: Grammar error: remove “that”

Line 285: change MEPED to MEPEDS

Line 288: change MEPED to MEPEDS on two occasions.

Line 289: grammar error: consider changing “Hided” to “concealed”

Line 299: grammar error: Consider changing “difficulty” to “difficult”

Line 306” grammar error: Consider changing “difficulty” to “difficult”

Paragraph line 298-307: consider adding how being selective with cycloplegia in the methodology may impact the results of your reference group, refer to research by Fotedar[4] and Leone[5]. Specifically those refractive errors (hyperopia and some astigmatism) that are not as detectable without cycloplegia would not have been excluded from the reference population of this study and impacted your True positive value.

Line 306: mentions “testability in our study was at an average level of published reports” consider adding: “which tested VA using the HOTV single surrounded letters, not linear.”

1. Leone JF, Mitchell P, Kifley A, Rose KA. Normative visual acuity in infants and preschool-aged children in Sydney. *Acta Ophthalmol (Copenh)* 2014; **92**(7): e521-e9.
2. Tidbury LP, Czanner G, Newsham D. Fiat Lux: the effect of

	illuminance on acuity testing. *Graefes Arch Clin Exp Ophthalmol* 2016; **254**(6): 1091-7. 3. Vanden Bosch ME, Wall M. Visual acuity scored by the letter-by-letter or probit methods has lower retest variability than the line assignment method. *Eye (London, England)* 1997; **11 (Pt 3)**: 411-7. 4. Fotedar R, Rochtchina E, Morgan I, Wang JJ, Mitchell P, Rose KA. Necessity of cycloplegia for assessing refractive error in 12-year-old children: a population-based study. *Am J Ophthalmol* 2007; **144**(2): 307-9. 5. Leone JF, Mitchell P, Morgan IG, Kifley A, Rose KA. Use of visual acuity to screen for significant refractive errors in adolescents: is it reliable? *Arch Ophthalmol* 2010; **128**(7): 894-9. 6. Leone JF, Gole GA, Mitchell P, Kifley A, Pai AS, Rose KA. Visual acuity testability and comparability in Australian preschool children: The Sydney Paediatric Eye Disease Study. *Eye (London, England)* 2012; **26**(7): 925-32.

REVIEWER	Valeria L.N. Fu Children's Hospital of Pittsburgh Department of Ophthalmology Pittsburgh PA U.S.A. I have no significant competing financial, professional or personal interests that may have influenced the review process on this manuscript.
REVIEW RETURNED	07-Feb-2017

GENERAL COMMENTS	It is an important manuscript tried to establish normative data for visual acuity in Chinese preschool population. It is a well design study which could provide a guideline for schools or pediatrists for referral to eye care specialists. There is a major confusion in the manuscript (Table 1) about the definition of amblyopia. Both (AAO and COS) define amblyopia as “visual acuity worse than” 20/50 in AAO and 20/40 in COS but Table 1 defined otherwise (BCVA <20/50 in either eye (AAO) and <20/40 in either eye (COS). It could be the typo of symbols “<” but the amblyopia analysis of this manuscript was based on this definition. Authors need to check their analysis carefully and confirm their analysis. Second, presentation of some data is not clear enough and it is hard to locate where those data derived from (please see comments in the Results session). Methods Under the section of Inclusion and exclusion criteria, were children with neurological problems excluded from this study? Results Under UCVA section, authors mentioned “About 60% of the measured monocular UCVAs fell in the category of 20/32.” In line 183, It is not clear where this “60%” came from. This type of unclear presentation is throughout the manuscript and it is very difficult for

	readers to follow. It suggests adding the numbers of participants such as “About 60% (478 out of 1,606)” to make it clear. Line 198, please add the numbers of participants for “75.2%”. In the “Effectiveness of the UCVA and UCVA IOD referral cutoffs” section, the authors reported some data such as in line 214 (84.5%), in line 215 (86.2%(25/29) and 74.2%(1170/1577). However, those values are not found in Table 6 or elsewhere. The authors need to explain how they obtained/derived those values from in order to support their findings. Tables Table 1 As mentioned in the General comments, please check the AAO and COS definitions. Table 6 In row “Unilateral Amblyopia”, please check the values of “Sensitivity “(11/14 (78.6) and “Specificity (1171/1601 (73.1).

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Hua Zhong
Institution and Country: The First Affiliated Hospital of Kunming Medical University, China
Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below
Zhu et al conducted an interesting study to document population-based normative data for uncorrected visual acuity (UCVA) in Chinese preschoolers aged 36 to < 48 months. I have a few concerns:
1. The study sample was drawn from all the age-matched Childrens in Yuhuatai District or part of it? How about the sample representativeness?
Response:
The study sample was drawn from all the age-matched children who resided in Yuhuatai District. The response rate was 78.5%, indicating good sample representativeness.

2. Is there a quantitative standard for the definition of the reference population?
Response:
The reference population was defined as the children without sight-affecting ocular conditions. The sight-affecting ocular conditions included myopia, hyperopia, astigmatism, anisometropia, amblyopia, strabismus, nystagmus, visual axis occlusion, or other anterior segment or fundus abnormalities capable of causing visual impairment. The quantitative standard for the definition of myopia, hyperopia, astigmatism, anisometropia or amblyopia was listed in the “Definitions” part in the methods. Strabismus was defined as a heterotropia at near and/or distance fixation. Nystagmus was defined as a vision condition in which the eyes make repetitive, uncontrolled movements. Visual axis occlusion, or other anterior segment or fundus abnormalities capable of causing visual impairment included cataract, glaucoma, retinopathy, optic nerve dysplasia, and so on.

3. In many studies, cycloplegic refraction was performed in all subjects. However in present study, it is performed only under certain conditions. What is the reason for this?
Response:
Young children are very afraid of using eye drops and will keep crying and closing their eyes if we try to drop 1.0% cyclopentolate in their eyes, which make cycloplegia difficult and very unacceptable for parents. Therefore, in our study, only children with suspected abnormities underwent cycloplegic

refraction.

4. Table 1 and table 2 is not necessary. The results could be replaced by words.
Response:
We have deleted table 1 and table 2, and replaced the results by words (lines 162-169 and 193-194).

Reviewer: 2
Reviewer Name: Nicola Anstice
Institution and Country: School of Optometry and Vision Science, The University of Auckland, New Zealand
Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below
This is an interesting and generally well written manuscript which addresses the importance of population and chart specific guidelines for the measurement of acuity in paediatric populations. As the authors note in the manuscript the detection of amblyopia is an important consideration for all preschool screening programmes and identifying appropriate referral cutoffs to ensure high sensitivity and reasonable specificity in specific populations is a valuable contribution to the literature.

Specific comments:
1. Line 93 - is 'ocular position' the same as 'ocular alignment' i.e. the presence or absence of strabismus?
Response:
'Ocular position' is the same as 'ocular alignment'. Both measures the presence or absence of strabismus.

2. Line 94 - replace 'rule' with 'role'
Response:
We have replaced ‘rule’ with ‘role’ (line 88).

3. Lines 111-119 - please could the authors provide more detail on how they used the handheld HOTV chart to determine UCVA in children. Did they show one letter on each line initially until and incorrect response? I am familiar with the ATS protocol used on computerized acuity charts but not familiar with how this would be adapted for a handheld chart.
Response:
A similar, standardized approach to the ATS protocol was adapted when we used the handheld HOTV chart to determine UCVA in children. The following is the detailed protocol (lines 109-136):
1) Screening
Patch the eye not being tested. Project a 20/100 optotype. If correct, go down a logMAR level and again show a single optotype. Continue through 20/20 with 1 letter per level until an incorrect response.
2) Phase 1
Move up 2 letter sizes from the letter size with the incorrect response in screening up to maximum size of 20/100.
 Present 4 new letters (if first 3 new letters are correct, then the fourth does not need to be tested; as soon as 2 letters are missed, testing of a level stops).
 If less than 3 letters are correct, proceed to the next largest size and so on until 3 of 4 are correct. When 3 of 4 are correct, proceed to “reinforcement”. If 20/100 is failed, stop testing.
 If 3 letters are correct, repeat on next smallest optotype. Continue to move to smaller optotypes as long as first 3 or 3 of 4 are correct. If 20/16 is passed, test is over. When 2 letters on a level are missed, stop and move to “reinforcement”.
3) Reinforcement

Move up 3 level from the level missed in phase 1 and show 3 successively smaller single letters. If the patient fails phase 1 at 20/63 or 20/80, show three 20/100 letters but still start phase 2 at the level failed in phase 1. Whether or not all 3 are correct in reinforcement, proceed to phase 2.
4) Phase 2
Retest the last level failed in phase 1. Continue the test by the same procedure as described for phase 1, with the exception that if 2 letters are missed, testing stops.
5) Recording Visual Acuity
Acuity is the smallest letter size (level) passed in phase 1 or phase 2.

4. In Table 4 the authors present results from their multivariate linear regression which identified that age had a significant effect on UCVA, that is UCVA improved with increasing age ($p < 0.0001$). However, it is interesting to note that the difference between UCVA in the 36-42 month old children is only 0.01 logMAR worse than the 42-48 month old children. This equate to less than one letter on a logMAR chart and some comment in the discussion about the clinical relevance of this would be good.
Response:
We have added some comment in the discussion as follows: 'However, the difference between UCVA in the 36- to <42-month-old children was only 0.01 logMAR worse than the 42- to <48-month-old children (Table 2), which might have no clinical significance.' (lines 282-284)

5. In Table 5 prematurity comes out as the only variable that is associated with poorer UCVA. However, the r-squared value is small. Some comment on the significance of this in the discussion would be useful.
Response:
We have added some comment in the discussion as follows: 'However, the r2 value was only 0.032, indicating that the significance of prematurity to UCVA might not be very high.' (lines287-289).

6. Line 289: replace 'hided' with 'hid'
Response:
We feel very sorry for the spelling mistake. In addition, we have changed 'hid' to 'concealed' as another reviewer suggested (line 316).

7. Line 298: delete 'that' before 'young children'
Response:
We have deleted 'that' before 'young children' (line 325).

8. Line 299: replace 'difficulty' with 'difficult'
Response:
We have replaced 'difficulty' with 'difficult' (line 326).

Reviewer: 3
Reviewer Name: Jody Leone
Institution and Country: University of Technology Sydney, Australia
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
Study Design will not adequately detect all hyperopic refractive errors to be able to label the reference group as a normative group. However, they have done their best to capture as many children as possible to ensure that most children will be captured with the normative group. They have detailed this impact in the discussion.

Are the methods described sufficiently to allow the study to be repeated?

Further information needs to be included in the paper to detail how endpoint threshold was determined as the increments are per line. Which specific vision chart was used including a part number or include a figure of the vision chart. What illumination was used, and how this was controlled for within the study. Fundus examination of the non-cycloplegic children needs to be described.
Response:
We included detailed information in our paper to show how visual acuity was determined as follows in the methods (lines 109-136):
1) Screening
Patch the eye not being tested. Project a 20/100 optotype. If correct, go down a logMAR level and again show a single optotype. Continue through 20/20 with 1 letter per level until an incorrect response.
2) Phase 1
Move up 2 letter sizes from the letter size with the incorrect response in screening up to maximum size of 20/100.
 Present 4 new letters (if first 3 new letters are correct, then the fourth does not need to be tested; as soon as 2 letters are missed, testing of a level stops).
 If less than 3 letters are correct, proceed to the next largest size and so on until 3 of 4 are correct. When 3 of 4 are correct, proceed to “reinforcement”. If 20/100 is failed, stop testing.
 If 3 letters are correct, repeat on next smallest optotype. Continue to move to smaller optotypes as long as first 3 or 3 of 4 are correct. If 20/16 is passed, test is over. When 2 letters on a level are missed, stop and move to “reinforcement”.
3) Reinforcement
Move up 3 level from the level missed in phase 1 and show 3 successively smaller single letters. If the patient fails phase 1 at 20/63 or 20/80, show three 20/100 letters but still start phase 2 at the level failed in phase 1. Whether or not all 3 are correct in reinforcement, proceed to phase 2.
4) Phase 2
Retest the last level failed in phase 1. Continue the test by the same procedure as described for phase 1, with the exception that if 2 letters are missed, testing stops.
5) Recording Visual Acuity
Acuity is the smallest letter size (level) passed in phase 1 or phase 2.

The catalogue number of the vision chart was 600017, which was indicated in the methods as follows: “Monocular distance UCVA measurements were attempted, first in the right eye, and then in the left, at 3 m by using a retroilluminated (ESV1200 Illuminated Cabinet, GOOD-LITE, USA) linear HOTV logMAR chart (600017, GOOD-LITE, USA) with matching letter card.” (lines 105-108). Fundus examination was done by indirect ophthalmoscopy, and we have described this in the method as requested (line 104).

More details attached.
Line 9: Spelling mistake: “Depsrtment” should be Department
Response:
We have replaced “Depsrtment” with “Department” (line 10).

Line 76: could also add Leone1 as a reference to your point too there, as VA differences in ethnicity was also found in that study.
Response:
We have added Leone1 as a reference to our point as suggested (line 71).

Line 106: Change “parent” to parent/s (which can incorporate one or both parents)
Response:
We have changed “parent” to “parent/s” as suggested (line 100).

Line 108: Consider removing “and so on” and replace with any other significant questions that were included in the questionnaire or remove “and so on” completely.
Response:
We have removed “and so on” completely as suggested (line 101).

Line 110: was the fundus evaluation performed on all children or only those that were dilated? Was it performed un-dilated on the children that were not dilated?
Response:
The fundus evaluation was performed on all children using indirect ophthalmoscopy (line 104). Indirect ophthalmoscopy was performed dilated on the children that were dilated, or un-dilated on the children that were not dilated.

Line 112: Which vision chart was selected? Please indicate the GOOD-LITE part number or catalogue number of the vision chart. Consider including a picture of the vision chart used. Was the chart used with a backlight box, or was it illuminated with room illumination only? If room illumination only was used to illuminate the chart, was the minimum illumination of 400-600lux achieved2? How was minimum illumination measured and controlled for?
Response:
The catalogue number of the vision chart was 600017 and the chart was used in GOOD-LITE's illuminated ESV1200 cabinet, which made sure that the minimum illumination (400-600lux) was achieved and controlled for. We have indicated the related information in the methods as follows: “Monocular distance UCVA measurements were attempted, first in the right eye, and then in the left, at 3 m by using a retroilluminated (ESV1200 Illuminated Cabinet, GOOD-LITE, USA) linear HOTV logMAR chart (600017, GOOD-LITE, USA) with matching letter card.” (lines 105-108). The picture of the vision chart could be found in the website of GOOD-LITE company. Thus, we think that it might be not necessary to include a picture of the vision chart in our paper.

Line 115: Methodology of determining the threshold of vision using the linear HOTV chart needs further explanation. How was the identification of each letter that the child needed to match conveyed to the child. Was it expressed in words (whilst avoiding pointing to the chart)? Or was each individual letter pointed out to the child with the examiners finger or a pointer? Perhaps was an occluder used to block out other lines either above or below the chart to assist the young child with locating which letter they need to identify?
Which letter was selected for the initial screening and reinforcement phase? A central letter or a letter on the side of the chart, or were various random letters chosen on each line?
Response:
We have added further explanation of the methodology of determining the threshold of vision using the linear HOTV chart in the methods as follows (lines 105-136): “Monocular distance UCVA measurements were attempted, first in the right eye, and then in the left, at 3 m by using a retroilluminated (ESV1200 Illuminated Cabinet, GOOD-LITE, USA) linear HOTV logMAR chart (600017, GOOD-LITE, USA) with matching letter card. VA scores were measured in 0.1 logMAR increments from 20/100 to 20/16. A similar, standardized approach to the Amblyopia Treatment Study (ATS) HOTV VA testing protocol was adapted:14
1) Screening
Patch the eye not being tested. Project a 20/100 optotype. If correct, go down a logMAR level and again show a single optotype. Continue through 20/20 with 1 letter per level until an incorrect response.
2) Phase 1
Move up 2 letter sizes from the letter size with the incorrect response in screening up to maximum size of 20/100.
 Present 4 new letters (if first 3 new letters are correct, then the fourth does not need to be tested; as

soon as 2 letters are missed, testing of a level stops).
 If less than 3 letters are correct, proceed to the next largest size and so on until 3 of 4 are correct. When 3 of 4 are correct, proceed to “reinforcement”. If 20/100 is failed, stop testing.
 If 3 letters are correct, repeat on next smallest optotype. Continue to move to smaller optotypes as long as first 3 or 3 of 4 are correct. If 20/16 is passed, test is over. When 2 letters on a level are missed, stop and move to “reinforcement”.
3) Reinforcement
Move up 3 level from the level missed in phase 1 and show 3 successively smaller single letters. If the patient fails phase 1 at 20/63 or 20/80, show three 20/100 letters but still start phase 2 at the level failed in phase 1. Whether or not all 3 are correct in reinforcement, proceed to phase 2.
4) Phase 2
Retest the last level failed in phase 1. Continue the test by the same procedure as described for phase 1, with the exception that if 2 letters are missed, testing stops.
5) Recording Visual Acuity
Acuity is the smallest letter size (level) passed in phase 1 or phase 2.”
For children who had difficulty in locating which letter they need to identify, an occluder was used to block out other lines either above or below the chart.

Line 117/118: As VA was recorded in 0.1logMAR increments, how was the end point of visual acuity calculated? For example, if 2 letters were missed on the threshold line was it still recorded at that threshold level? or was it a full line of letters had to be achieved to be recorded as the threshold? If 3 or more letters were missed on a line was it then the previous line was used as threshold calculated? This will impact the results that were reported3.
Response:
We have added further explanation of how the end point of visual acuity was calculated in the methods. Commonly, we will present 4 new letters in a level and continue to move to smaller optotypes as long as first 3 or 3 of 4 letters are correct. When 2 letters on a level are missed, the previous line will be used as threshold calculated.

Line 125/127: used the value (2) twice, on line 127 will need to change “(2)” to “(3)” and “(3)” to “(4)”
Response:
We are very sorry for this mistake. We have changed “(2)” to “(3)” and “(3)” to “(4)” (line 144).

Line 166: grammar error: replace “than” with “then”
Response:
We have replaced “than” with “then”.

Line 237: mention that tumbling E is “harder” this term can be ambiguous, consider adding “harder cognitively for the child to understand and thus affect the threshold acuity that can be achieved by the child.”
Response:
As suggested, we have changed the sentence into “while SKES used the ETDRS Tumbling E chart which is harder cognitively for the child to understand and thus affect the threshold acuity that can be achieved by the child” (lines 251-253).

Line 245: add respectively to: (0.19 vs. 0.17 logMAR)
Response:
As suggested, we have added “respectively” to: (0.19 vs. 0.17 logMAR) (line 261).

Line 253: state how the linear HOTV is different to the ATS HOTV (ATS HOTV uses a single letter surrounded by Bars ½ the letter width from the optotype).
Response:

As suggested, we have stated how the linear HOTV is different to the ATS HOTV as follows: “the ATS HOTV VA test, which uses a single letter surrounded by bars optimally placed at half the optotype height from the letter optotype, is quite different from the linear HOTV logMAR chart that we used” (lines 268-270).

Line 252: The study mentions that “However, the significances of such comparisons are not very clear” Further explanation should be added as there is available evidence for the reasons for differences found. I have suggested a few here, and they could be added, in a shortened form within your discussion.
ATS HOTV (MEPEDS) gave similar VA to your study, whereas the SPEDS1 study found better VA by approximately 1 line (using the ATS HOTV single surrounded) when compared to this study of the YPEDS children. This may be due to methodology, as cycloplegia was performed on all children in SPEDS and MEPEDS vs cycloplegia on selected suspected children for YPEDS. The most likely group to be missed in due to this methodology is any children with moderate to high levels of hyperopia, due to accommodative reserves of these children.4,5 Fotedor4 and Leone5 and a few others have found than non-cycloplegic refraction will underdiagnose any children with hyperopia due to accommodative reserves. This may produce a proportion of children with slightly reduced VA in the population due to hyperopia, thus possibly affecting the mean VA of your reference population, but the VA of this group was not reduced enough to cause them to be excluded and to elicit a response to perform a cycloplegic refraction.
Another reason could be due to ATS HOTV being a single surrounded test and the ATS HOTV is cognitively easier to perform by pre-schoolers than the linear chart6, thus ATS HOTV shows improved values for VA by 1 line, and explains why YPEDS has found a lowered VA by 1 line when compared to SPEDS, as YPEDS study has used the Linear chart to do visual acuity.
In addition, ethnicity differences between studies could also be a cause of the differences. Specifically SPEDS1 found that East Asian children had significantly poorer VA than their European Caucasian counterparts. In the SPEDS study this equated to 1-2 letters difference, and may have impacted your findings when compared to other studies findings. The introduction mentions these differences too.
Methodology of SPEDS included a retroilluminated chart when testing HOTV and ETDRS linear acuity. The methodology of YPEDS is ambiguous as to what level of illumination was used during vision testing (as indicated this needs to be discussed in the methodology), and if the illumination was not controlled (below 400 lux) or was not retroilluminated, this may have impacted the results found.2

Response:
We have added these reasons in a shortened form within our discussion as follows: “The better VA by approximately 1 line (using the ATS HOTV test) found in SPEDS when compared to our study might be due to the following reasons: (1) Non-cycloplegic refraction was performed on part of children in our reference population, which may underdiagnose hyperopia due to accommodative reserves20-21 and then produce slightly reduced VA in the reference population due to hyperopia; (2) The ATS HOTV is cognitively easier to perform by preschoolers than the linear chart;22 (3) Leone et al found that East Asian children had significantly poorer VA than their European Caucasian counterparts,7 which indicated that ethnicity differences might have impacted our findings.” (lines 272-280).

Line 252: Grammar error: remove “that”
Response:
We have removed “that”.

Line 285: change MEPED to MEPEDS
Response:
We have changed MEPED to MEPEDS.

Line 288: change MEPED to MEPEDS on two occasions.

Response:
We have changed MEPED to MEPEDS.

Line 289: grammar error: consider changing “Hided” to “concealed”
Response:
We have changed “Hided” to “concealed” (line 316).

Line 299: grammar error: Consider changing “difficulty” to “difficult”
Response:
We are very sorry for the spelling mistake. We have changed “difficulty” to “difficult”.

Line 306” grammar error: Consider changing “difficulty” to “difficult”
Response:
We have changed “difficulty” to “difficult”.

Paragraph line 298-307: consider adding how being selective with cycloplegia in the methodology may impact the results of your reference group, refer to research by Fotedar4 and Leone5. Specifically those refractive errors (hyperopia and some astigmatism) that are not as detectable without cycloplegia would not have been excluded from the reference population of this study and impacted your True positive value.
Response:
We have added how being selective with cycloplegia in the methodology may impact the results of our reference group as follows: “However, Fotedar et al20 and Leone et al21 found that hyperopia and some astigmatism might not be as detectable without cycloplegia, which might impact the findings of our reference population at some degree.” (lines 330-333).

Line 306: mentions “testability in our study was at an average level of published reports” consider adding: “which tested VA using the HOTV single surrounded letters, not linear.”
Response:
We have changed the sentence into “However, the testability in our study was at an average level of published reports,6, 10 which tested VA using the HOTV single surrounded letters, not linear, and difficult to increase further in young children.” (lines 334-337).

1. Leone JF, Mitchell P, Kifley A, Rose KA. Normative visual acuity in infants and preschool-aged children in Sydney. Acta Ophthalmol (Copenh) 2014; 92(7): e521-e9.
2. Tidbury LP, Czanner G, Newsham D. Fiat Lux: the effect of illuminance on acuity testing. Graefes Arch Clin Exp Ophthalmol 2016; 254(6): 1091-7.
3. Vanden Bosch ME, Wall M. Visual acuity scored by the letter-by-letter or probit methods has lower retest variability than the line assignment method. Eye (London, England) 1997; 11 (Pt 3): 411-7.
4. Fotedar R, Rochtchina E, Morgan I, Wang JJ, Mitchell P, Rose KA. Necessity of cycloplegia for assessing refractive error in 12-year-old children: a population-based study. Am J Ophthalmol 2007; 144(2): 307-9.
5. Leone JF, Mitchell P, Morgan IG, Kifley A, Rose KA. Use of visual acuity to screen for significant refractive errors in adolescents: is it reliable? Arch Ophthalmol 2010; 128(7): 894-9.
6. Leone JF, Gole GA, Mitchell P, Kifley A, Pai AS, Rose KA. Visual acuity testability and comparability in Australian preschool children: The Sydney Paediatric Eye Disease Study. Eye (London, England) 2012; 26(7): 925-32.

Reviewer: 4
Reviewer Name: Valeria L.N. Fu
Institution and Country: Children's Hospital of Pittsburgh, Department of Ophthalmology, Pittsburgh

PA, U.S.A.
Please state any competing interests or state 'None declared': I have no significant competing financial, professional or personal interests that may have influenced the review process on this manuscript.

Please leave your comments for the authors below
It is an important manuscript tried to establish normative data for visual acuity in Chinese preschool population. It is a well design study which could provide a guideline for schools or pediatrists for referral to eye care specialists. There is a major confusion in the manuscript (Table 1) about the definition of amblyopia. Both (AAO and COS) define amblyopia as "visual acuity worse than" 20/50 in AAO and 20/40 in COS but Table 1 defined otherwise (BCVA <20/50 in either eye (AAO) and <20/40 in either eye (COS). It could be the typo of symbols "<" but the amblyopia analysis of this manuscript was based on this definition. Authors need to check their analysis carefully and confirm their analysis.
Response:
We are very sorry for our confusing expressions in Table 1. As requested by reviewer 1, we deleted table 1. Then, the definitions of amblyopia were expressed by words as follows: 'To be comparable with SKES, two definitions of amblyopia were adopted in the present report. Amblyopia risk factors should be identified when diagnosing amblyopia in each of the definitions: (1) the American Academy of Ophthalmology (AAO) amblyopia Preferred Practice Pattern (PPP) guidelines define unilateral amblyopia in preschoolers aged 36 to < 48 months as an IOD of greater than or equal to two lines of BCVA, and bilateral amblyopia as BCVA less than 20/50 in either eye;15 (2) the Chinese Ophthalmology Society (COS) guidelines define amblyopia in preschoolers aged 36 to < 48 months as an IOD of greater than or equal to two lines of BCVA or BCVA less than 20/40 in either eye.16' (lines 161-169). In addition, we have checked our analysis carefully to make sure they were correct.

Second, presentation of some data is not clear enough and it is hard to locate where those data derived from (please see comments in the Results session).

Methods
Under the section of Inclusion and exclusion criteria, were children with neurological problems excluded from this study?
Response:
Children with neurological problems were excluded from this study. We have modified the section of Inclusion and exclusion criteria as follows: 'Only Chinese children aged 36 to < 48 months able to complete monocular UCVA testing in both eyes and without neurological problems were included in the analysis and considered as the general study population.' (line 173).

Results
Under UCVA section, authors mentioned "About 60% of the measured monocular UCVAs fell in the category of 20/32." In line 183, It is not clear where this "60%" came from. This type of unclear presentation is throughout the manuscript and it is very difficult for readers to follow. It suggests adding the numbers of participants such as "About 60% (478 out of 1,606)" to make it clear.
Response:
We have added the numbers of participants for "60%" as follows: 'About 60% (478 out of 791) of the measured monocular UCVAs fell in the category of 20/32.' (lines 200-201).

Line 198, please add the numbers of participants for "75.2%".
Response:
We have added the numbers of participants for '75.2%' as follows: '75.2% (595 out of 791)' (line 214).

In the "Effectiveness of the UCVA and UCVA IOD referral cutoffs" section, the authors reported some data such as in line 214 (84.5%), in line 215 (86.2%(25/29) and 74.2%(1170/1577). However, those

values are not found in Table 6 or elsewhere. The authors need to explain how they obtained/derived those values from in order to support their findings.
Response:
We are very sorry for these confusions and added the values in Table 4 in the revised manuscript (line 233).

Tables
Table 1
As mentioned in the General comments, please check the AAO and COS definitions.
Response:
We are very sorry for our confusing expressions in Table 1 and checked the AAO and COS definitions. As requested by reviewer 1, we deleted table 1 and represented the results by words in the methods (lines 162-169).

Table 6
In row “Unilateral Amblyopia”, please check the values of “Sensitivity “(11/14 (78.6) and “Specificity (1171/1601 (73.1).
Response:
We have checked the values of “Sensitivity “(11/14 (78.6) and “Specificity (1171/1601 (73.1) in row “Unilateral Amblyopia” and confirmed that they were right.

VERSION 2 – REVIEW

REVIEWER	Hua Zhong The First Affiliated Hospital of Kunming Medical University
REVIEW RETURNED	24-Mar-2017

GENERAL COMMENTS	The article has been modified according to the recommendations suggested by the reviewers.