The Use of Mobile Application to Improve Chinese Reading Performance in Children with Dyslexia

透過流動應用程式改善讀寫障礙兒童的中文閱讀表現

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Dyslexia

- Children with dyslexia face huge difficulty learning to read
  - Despite adequate schooling, age, normal IQ and visual acuity

- It is a complex disorder involving neural, cognitive and genetic factors (Hancock et al., 2017)

- Disentangling cause(s) from effect in dyslexia has been difficult (Goswami, 2015)
  - Deficits in various factors might result from reduced reading in children with dyslexia
  - Intervention studies provide the strongest test of causation

- Designing effective intervention strategies has been a major challenge

Intervention Strategies with Dyslexia

- Common interventional approaches
  - Often focused on single factors (e.g., phonological awareness, word reading practice, etc)
  - Often labor-intensive
  - Effectiveness often challenged (Gori et al., 2015; Galuschka et al., 2014)

- Other interventional approaches are effective but may not be ‘central’ to the problem

Extra-large letter spacing improves reading in dyslexia

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Report

Action Video Games Make Dyslexic Children Read Better

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strategies) appears to be the most efficient treatment [1, 2, 13]. However, all the existing treatments are controversial and demand high levels of resources. Moreover, the cognitive processes underlie the improvements in reading ability remain unclear [1, 4].

Attentional dysfunction is an important core deficit in dyslexic individuals [6, 9–12, 16–18]. Letters must be precisely

Rayman Raving Rabbids wii

Individual Variability in Chinese Dyslexia is High

Rapid Naming tasks

Phonological tasks

Orthographic tasks

Visual tasks

Task	% of children with deficit		Average %	
	This study	Ho et al.'s study	This study	Ho et al.'s study
Rapid naming subtests			**57.1**	50.0
Digit Naming	57.1	53.3		
Colour Naming	–	60.0		
Picture Naming	–	36.7		
Phonological subtests			**29.3**	15.3
Sound Discrimination	–	10.0		
Rhyme Detection	21.1	20.0		
Onset Detection	29.3	20.0		
Word Repetition I	32.0	20.0		
Word Repetition II	37.0	–		
Nonword Repetition	27.2	6.7		
Orthographic subtests			**42.0**	38.9
Left/Right Reversal	46.3	46.7		
Lexical Decision	44.2	33.3		
Radical Position	35.4	36.7		
Visual subtests			**27.1**	36.7
Visual Discrimination	25.2	36.7		
Visual Memory	28.6	46.7		
Visual Spatial Relationships	30.6	40.0		
Form Constancy	–	26.7		
Visual Closure	23.8	33.3		

Ho et al., 2004

An Innovative Intervention Approach

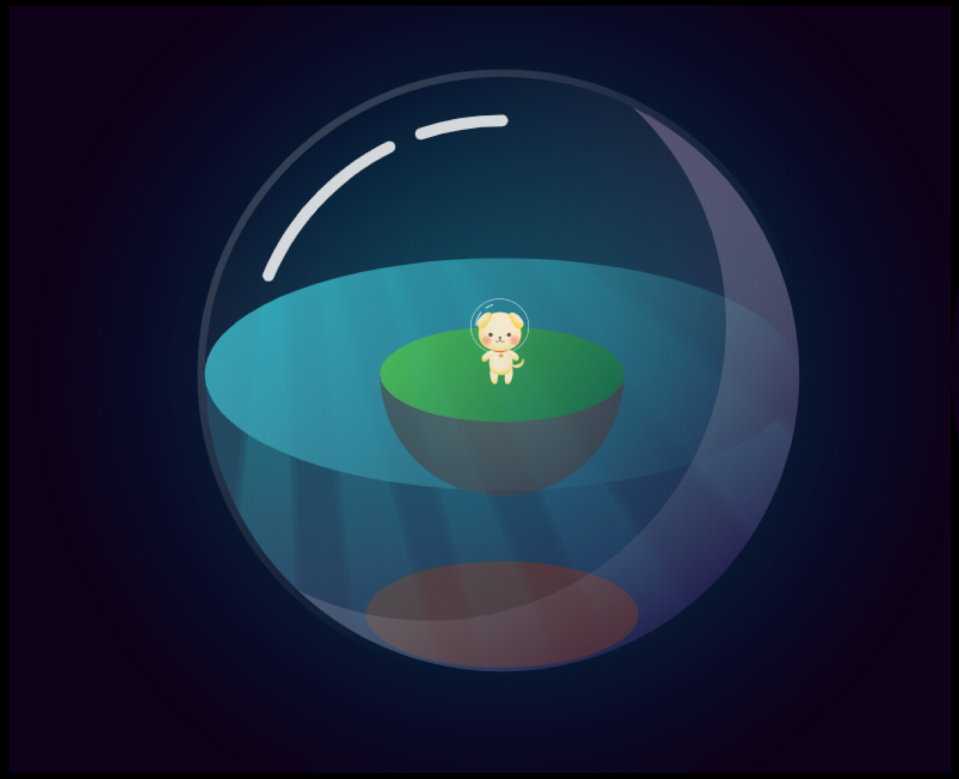
- A multi-component approach to intervention
  - Focused on visual perceptual skills, a reading-related bottleneck that is relatively easy to train
  - Mixed visual, visuoauditory and visuomotor skills with other cognitive demands;
- Individualized progress
  - Allowed flexible improvement of individuals based on their abilities
- Computerized and mobile training
  - Assisted with some face-to-face training
- Motivated learning
  - A gamified learning context

Our In-house Developed Mobile Application

Works for websites and mobile devices (tablets and cell phones)

Our In-house Developed Mobile Application

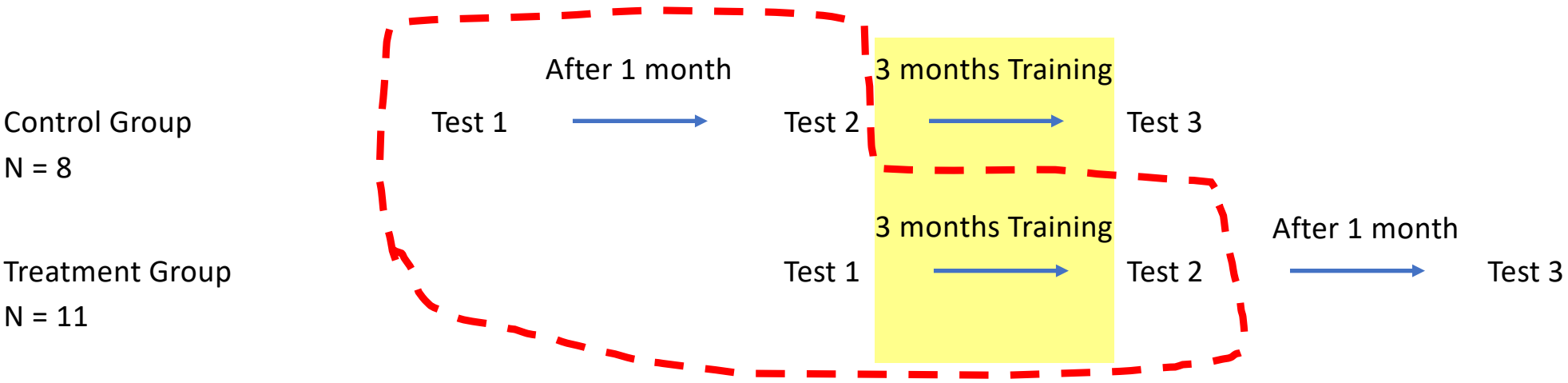
Our In-house Developed Mobile Application



Our Project (Work in Progress)

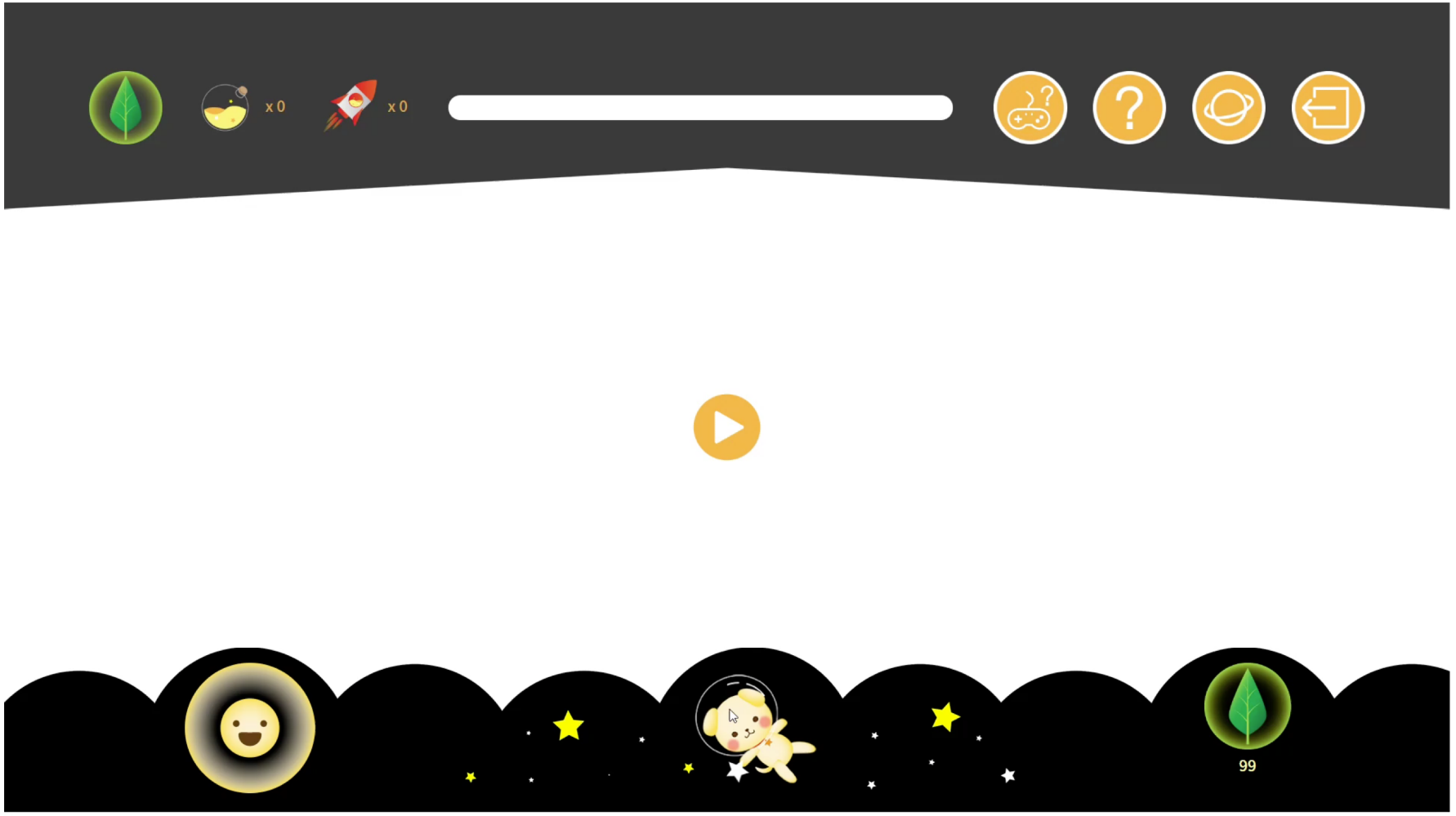
- We collaborated with 2 schools with 19 students with dyslexia

- Design
  - 20-hour training at school as after-school activities
  - A randomized-controlled trial design

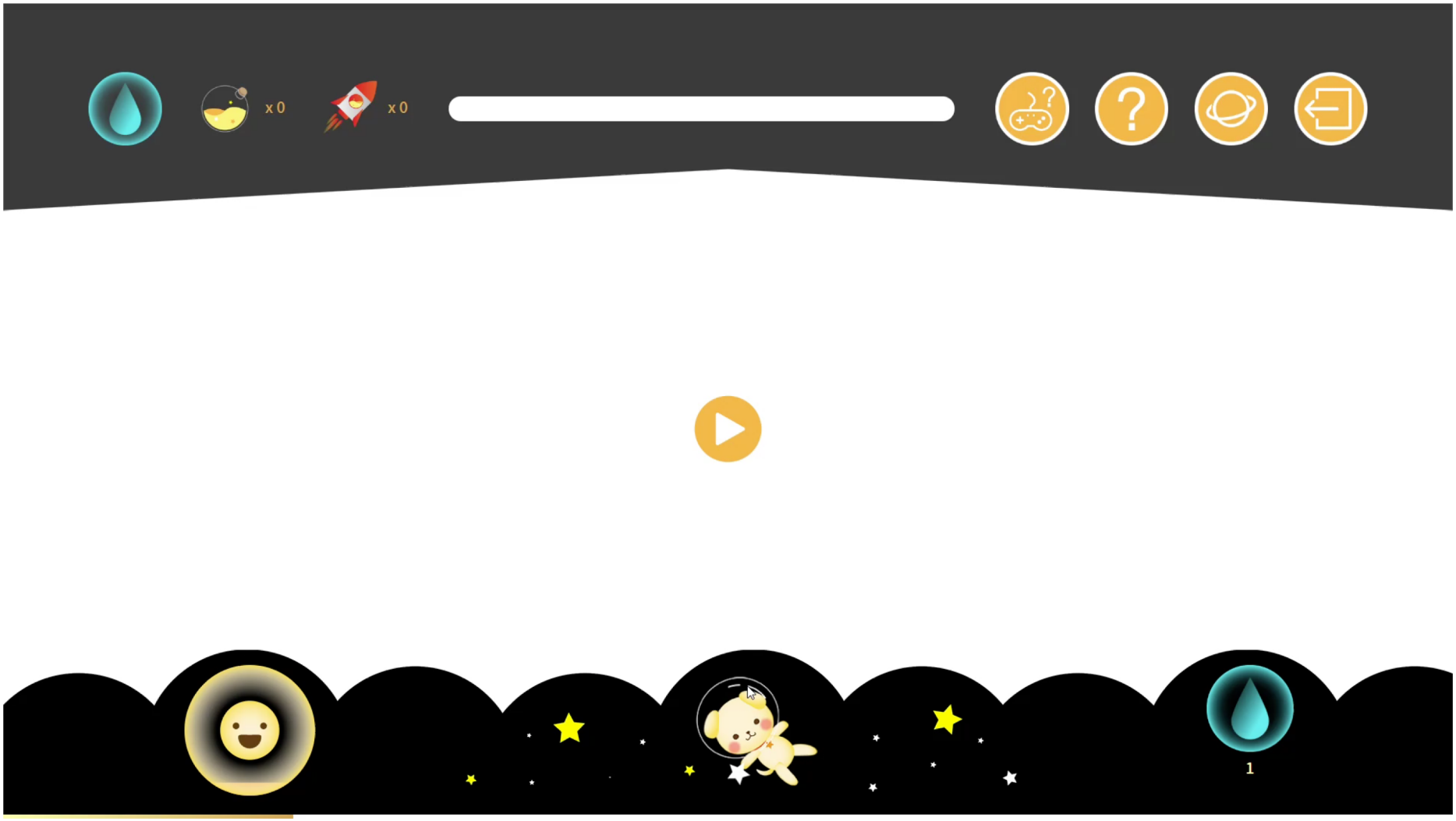


Game 1 (easy)

Game 1 (difficult)

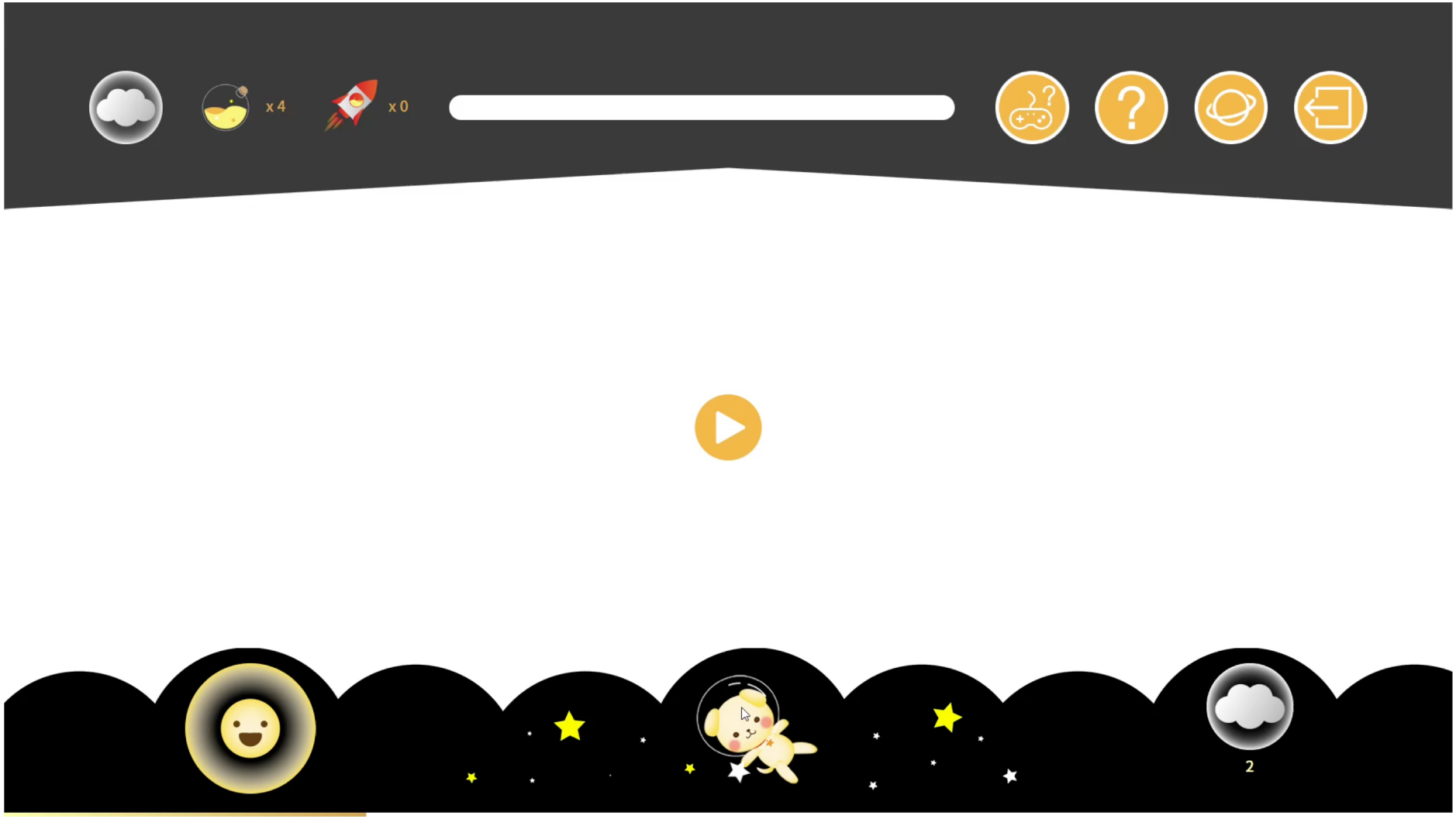


Game 2 (easy)



Game 2 (difficult)

Game 3 (easy)



Game 3 (difficult)

Game 4 (easy)

Game 4 (difficult)

Game 5

1

1 7 6 9 5 3 0 4

1

4 2 7 5

0 9 6 1

1

7 0 5 8 4 2 6 3

7 5 1 3 6 2 9 8

2

6 1 8 7 5 4 2 3

2

5 4 2 6

0 9 7 8

2

1 8 2 6 0 3 7 4

4 0 1 5 6 7 8 2

Reading Measures

Non-speeded reading

Trained characters

Transfer characters

The number of correctly read characters

Speeded Reading

Trained characters

Transfer characters

人 卜 十 中 六 大 七 五 戈

八 廿 山 三 四 二 心 一 九

The number of correctly read characters in 30s

(Other perceptual and cognitive measures were also available)

Conclusions

- Our training improved word reading performance in children with dyslexia

- Theoretical contribution
  - Visual perceptual bottleneck might be an important *cause* of reading deficits in dyslexia

- Practical contribution
  - We designed an effective training intervention for Chinese dyslexia

Conclusions

- Why does it work?
  - Multi-component, individualized, gamified, computerized and mobile
- It is a promising intervention strategy for dyslexia
  - Cost-effective, accessible, fun, and cater for diversified needs of individual learners
- It is a potentially fun learning strategy for all Chinese learners
- Work in progress
  - In collaboration with 4 schools
  - We welcome future long-term collaborations with schools

Questions and Comments?

To learn more about our work

The Learning and Perception Lab, CUHK

https://sites.google.com/view/yettawong/home

To learn more about this website

For questions, comments and collaborations

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For future release (end of 2020), testing accounts, etc.

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