Penguin in the Desert

Semantic Proximity and Memory Performance

Group Members

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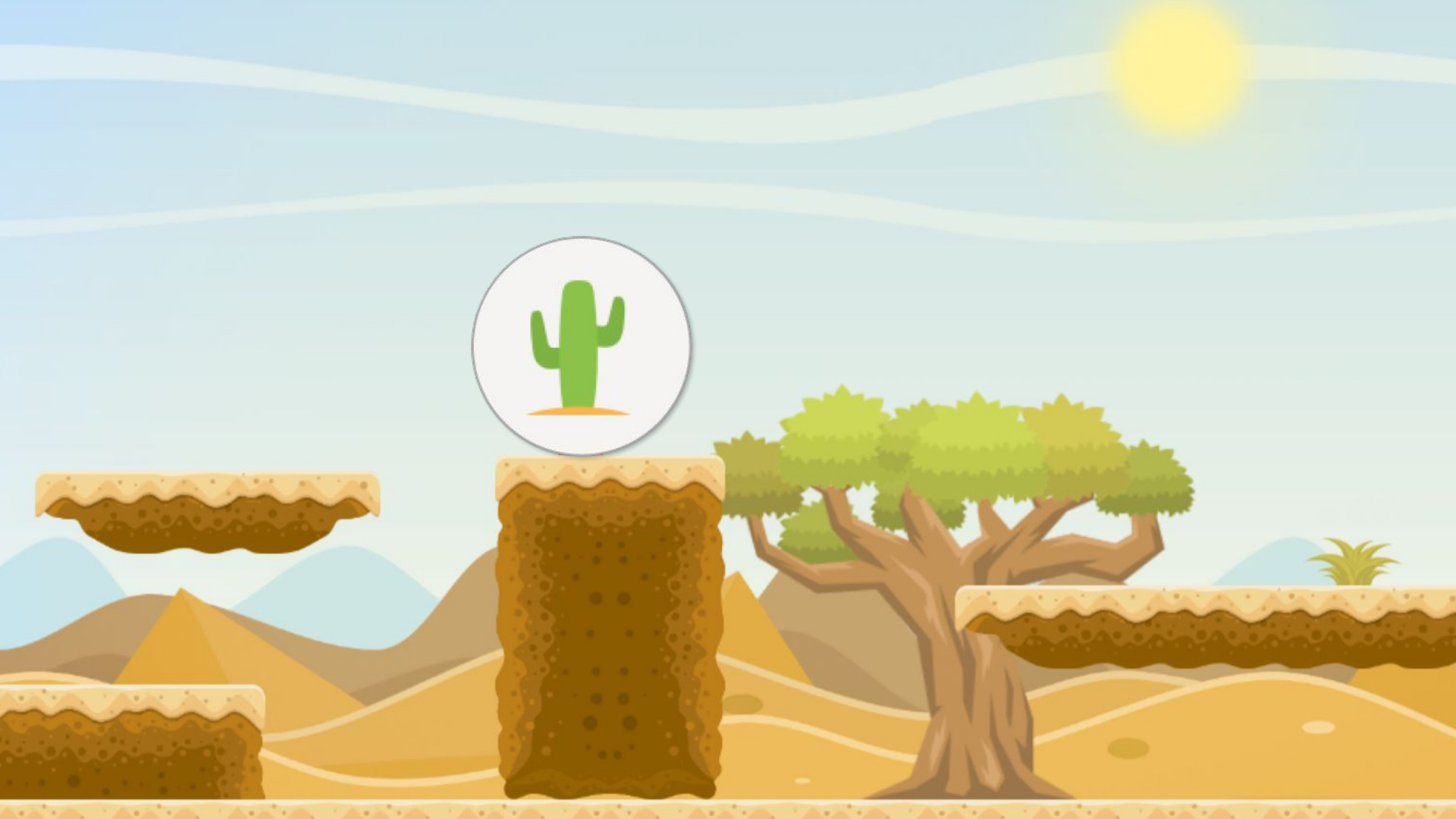


Hypothesis

H1: Recognition performance will be positively correlated with semantic proximity

“People are more likely to remember objects that are paired with visuals that are familiar for that object.” → e.g. cactus in the desert

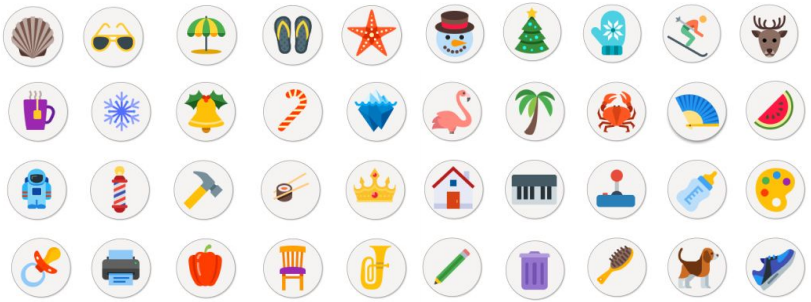
Methods

Methods

4 different backgrounds

80 objects in total

Covering the whole distribution of semantic proximity



Game Task → Recognition Task → Classification Task → Within-subject design

Methods

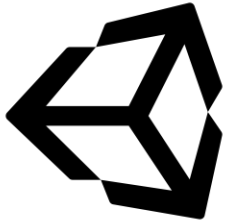
- Game with 4 different backgrounds (levels)
- Each level has 20 objects associated with it. Items for each level will be chosen to try to cover the whole distribution of semantic proximity (total of 80 objects)
- *Game Task:* subjects play the game
- *Recognition Task:* Subjects are shown a set of seen and unseen objects in the end and are asked to recognise the ones they came across during the game
- *Classification Task:* Subjects rank object-background semantic proximity on a scale of (1) “this doesn’t belong here” to (6) “this belongs here”
- *Within-subject design:* We measure if the rating for semantic proximity correlates with the recognition performance

Choosing Game Assets

- Backgrounds will be: Desert, Jungle, Beach, Snowy Landscape
- Objects will be picked at random from a large catalog of objects
- Using a classification dataset like WordNet or Word2Vec, we will ensure that only 50% of objects are very positively or negatively correlated with their background, leaving 50% as “moderately correlated.”

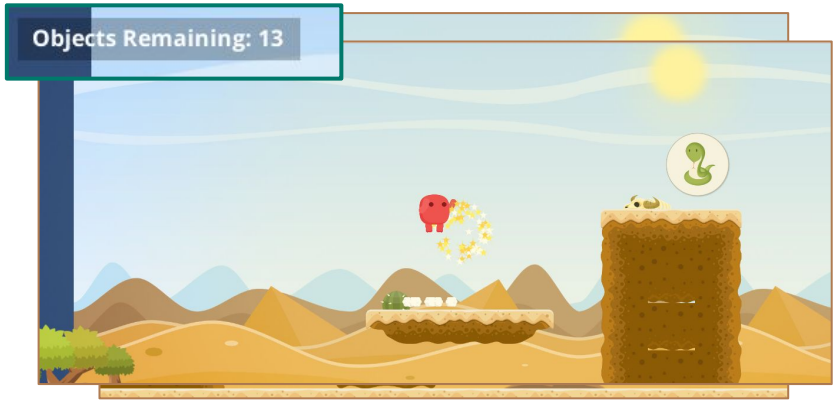
Game Task

Game Task



- 2D Unity Game
- “Platformer”/”Sidescroller”-style game (like Super Mario Bros)
- 4 Levels, each with its own background
- 20 objects placed in a random order and at random intervals throughout level
- Player must “collect” each object by jumping on it
- The player doesn’t complete the level until all objects are collected.

Game Task



2D Unity Game

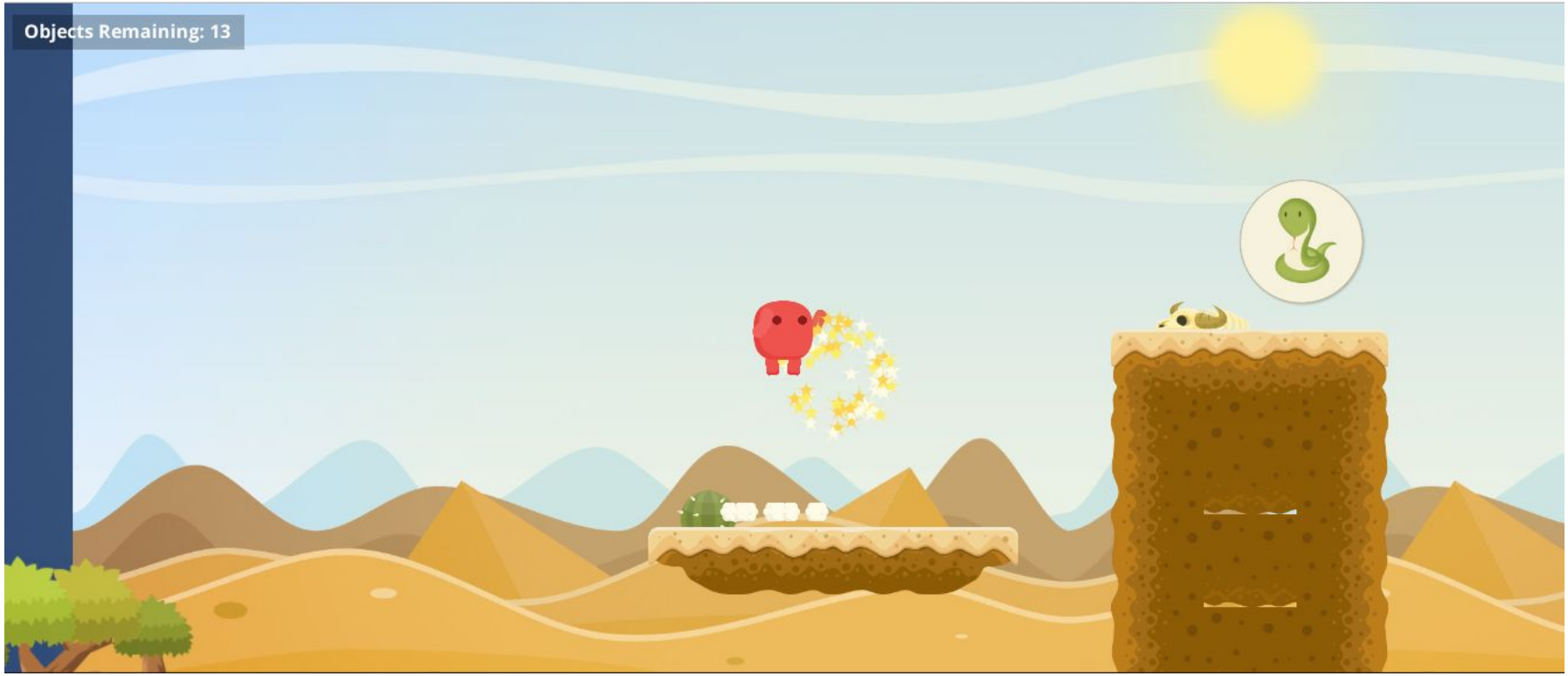
"Platformer"/"Sidescroller"-style game

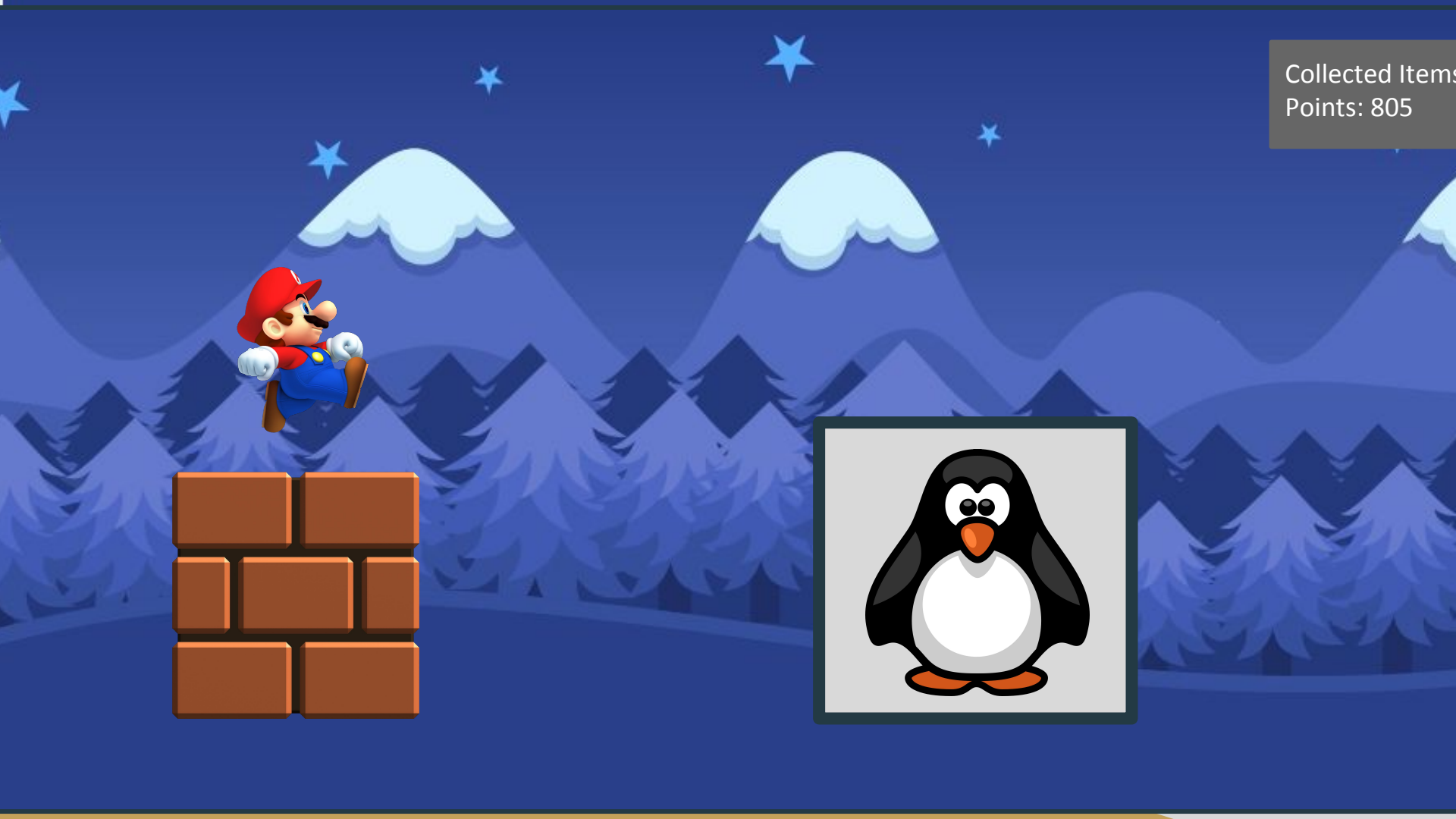
4 Levels, each with its own background

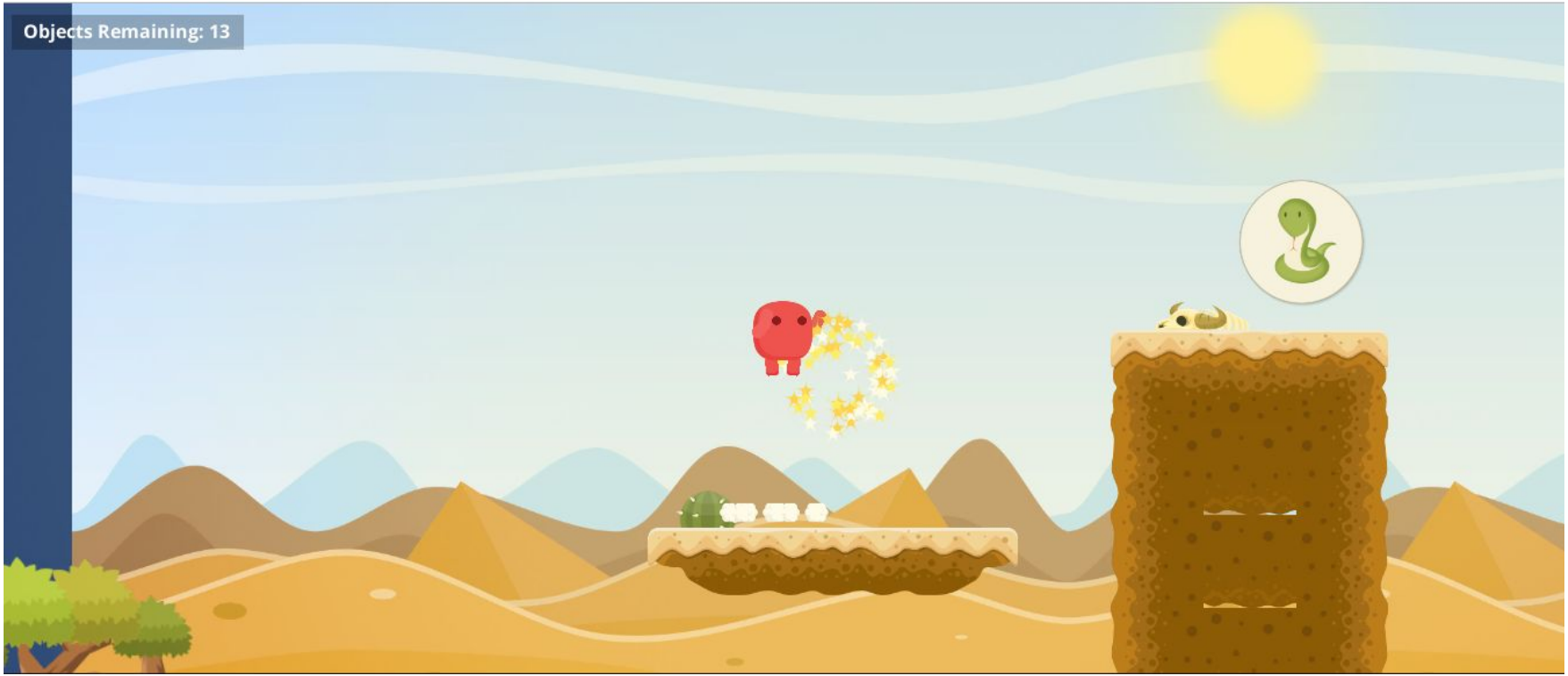
20 objects placed in a random order and at random intervals throughout level

Player must "collect" each object by jumping on it

The level isn't completed until all objects are collected


Objects Remaining: 13


Collected Items
Points: 805


Objects Remaining: 13

Survey

Object Recognition

- Survey conducted in the SoSci platform
- Subjects are shown a set of 80 objects, 40 seen and 40 unseen, in random order
- For each object subjects are asked to recognise the ones they came across during the game
- They answer on a confidence scale from 1 (“Yes, very confident”) to 6 (“No, very confident”)

Object Recognition

Survey conducted in soSci der onlineFragebogen

Subjects are shown, in random order, **80 objects:** 40 **seen** 40 **unseen**

Subjects are asked to recognise the objects they came across during the game, and answer on a confidence scale from 1 to 6

1	Yes, very confident	Yes, confident	Yes, maybe	No, maybe	No, confident	No, very confident	6

soSci
oFb - der onlineFragebogen

Did you see this object in the game?

Please click or use the left and right arrow keys to select “Yes” or “No”

Yes, very confident | Yes, confident | Yes, maybe | No, maybe | No, confident | No, very confident

soSci
oFb - der onlineFragebogen

Did you see this object in the game?

Yes, very confident | Yes, confident | Yes, maybe | No, maybe | No, confident | No, very confident

Semantic Proximity

- For each of the 4 scenes, subjects are shown 20 objects and are asked how well each object fits
- Objects are the same as in recognition task, shuffled within each background
- Both of the seen and unseen objects consist of 30% “highly-correlated”, 30% “negatively-correlated” and 40% “random” objects
- Subjects rank object-background semantic proximity on a scale from 1 (“Not at all”) to 5 (“Fits perfectly”)

Semantic Proximity

Subjects are shown the same 20 objects/scene as in the recognition task, shuffled within each background

Both seen and unseen objects consist of:

- 30% “highly-correlated” objects
- 30% “negatively-correlated” objects
- 40% “random” objects

Subjects are asked how well the objects fit into the background

Semantic proximity is ranked on a scale from 1 to 5

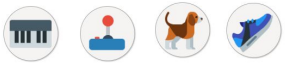
How well do you think the object below fits the environment on the right?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Fits perfectly

How well do you think the object below fits the environment on the right?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Fits perfectly

Example: Objects asked for the winter scene

	Seen: 3 Highly correlated
	Seen: 3 Negatively correlated
	Seen: 4 Random
	Not Seen: 3 Highly correlated
	Not Seen: 3 Negatively correlated
	Not Seen: 4 Random

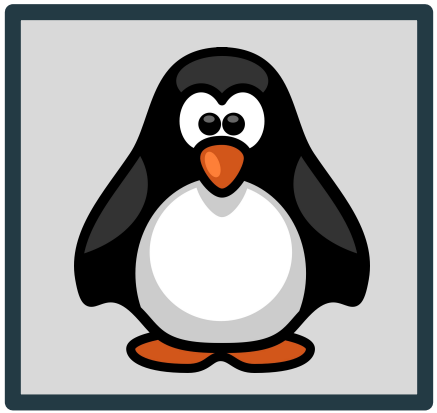
Example: Objects asked for the winter scene

WINTER

	Seen: 3 Highly correlated
	Seen: 3 Negatively correlated
	Seen: 4 Random
	Not Seen: 3 Highly correlated
	Not Seen: 3 Negatively correlated
	Not Seen: 4 Random

Did you see this object in the game?

YES



NO

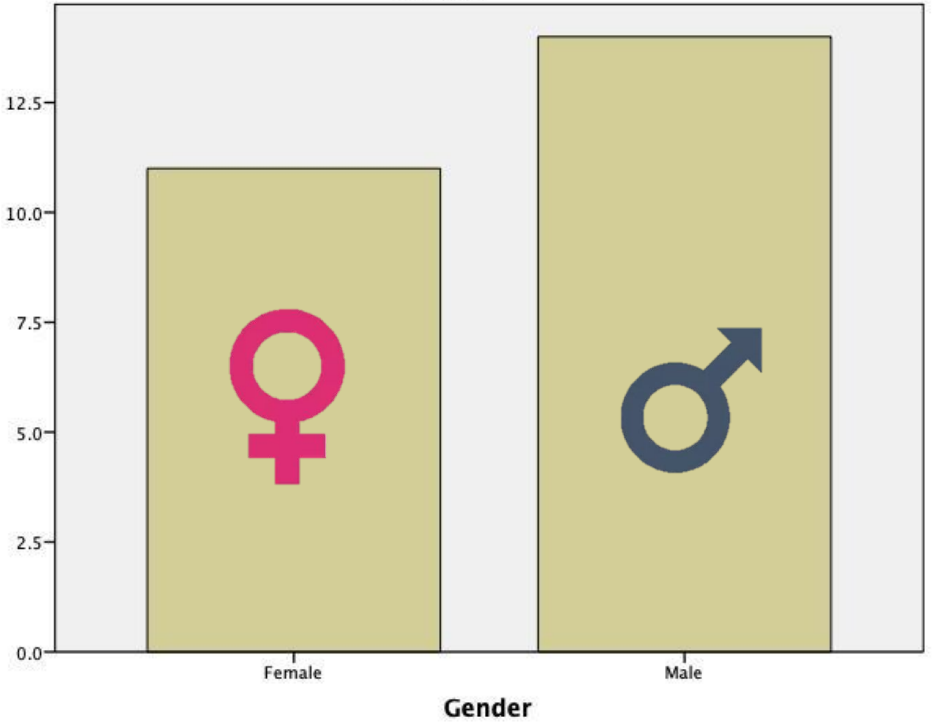
How confident are you in your choice?

1 2 3 4 5 6 7

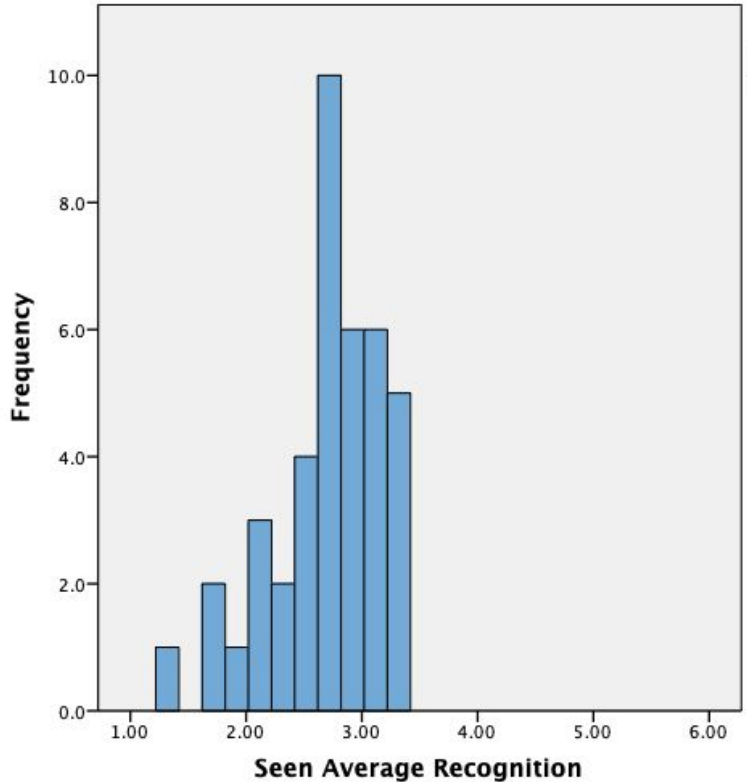
Results

Demographics

- N = 25
- Age: 20 - 34 years
- Slightly more male participants



Recognition Performance: Seen Items



- Scale:
  - 1 = yes, very confident
  - 3 = yes, maybe
  - 6 = no, very confident
- Mean = 2.70, Std. Dev. = 0.5
- Overall very good recognition performance

Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Average Recognition	,130	40	,086	,936	40	,026

a. Lilliefors Significance Correction

Our data is not normal

Spearman Correlation

H1: Recognition performance will be positively correlated with semantic proximity

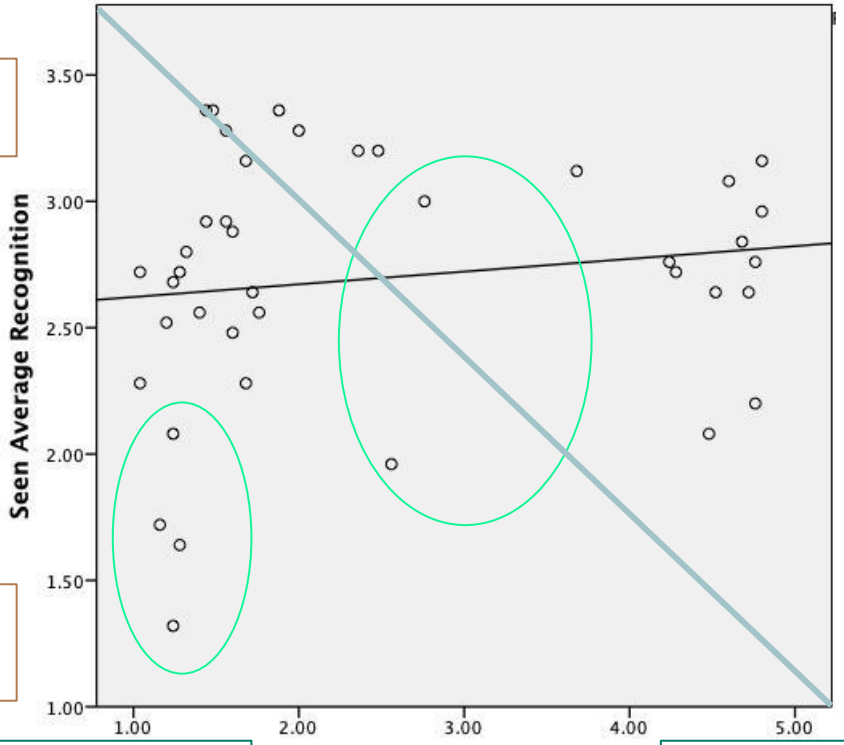
			Average FitintoContext
Spearman's rho	Average Recognition	Correlation Coefficient	,269
		Sig. (2-tailed)	,094
		N	40

Slightly significant!

But not what we expected...

Spearman Correlation

Bad performance



Coefficient = 0.27

Good performance

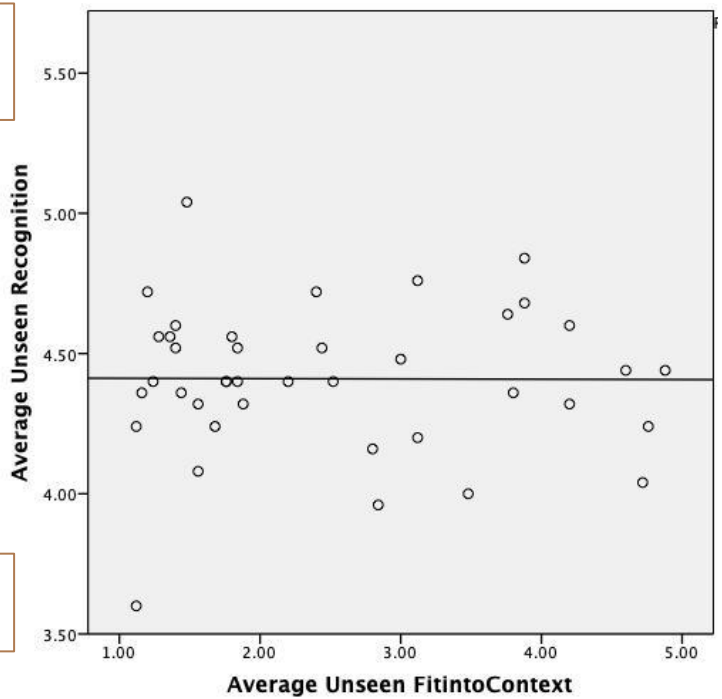
Average Rating = 2.5 (out of 6)

Doesn't fit

Fits perfectly

Spearman Correlation: Unseen Items

Good performance



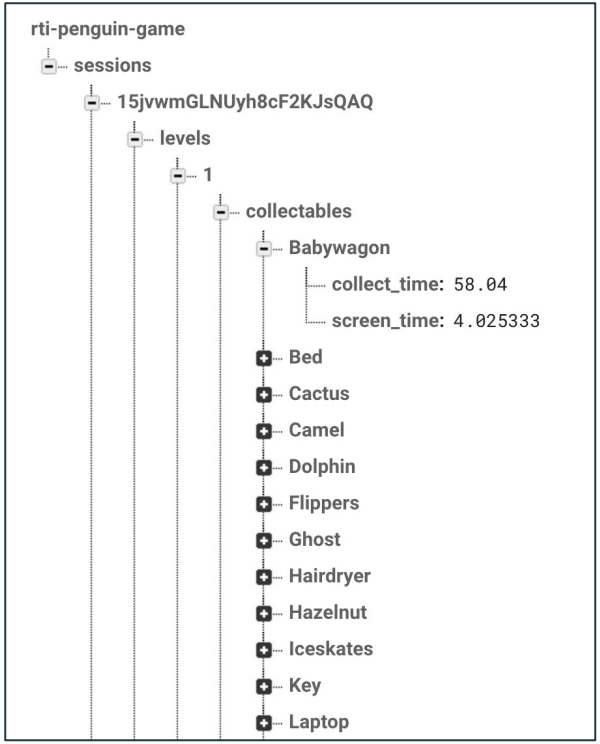
Bad performance

- No significant correlation
- Mean Recognition = 4.4
- Average fit into context rating = 2.5
- Overall also very good discrimination performance

In-Game Logging

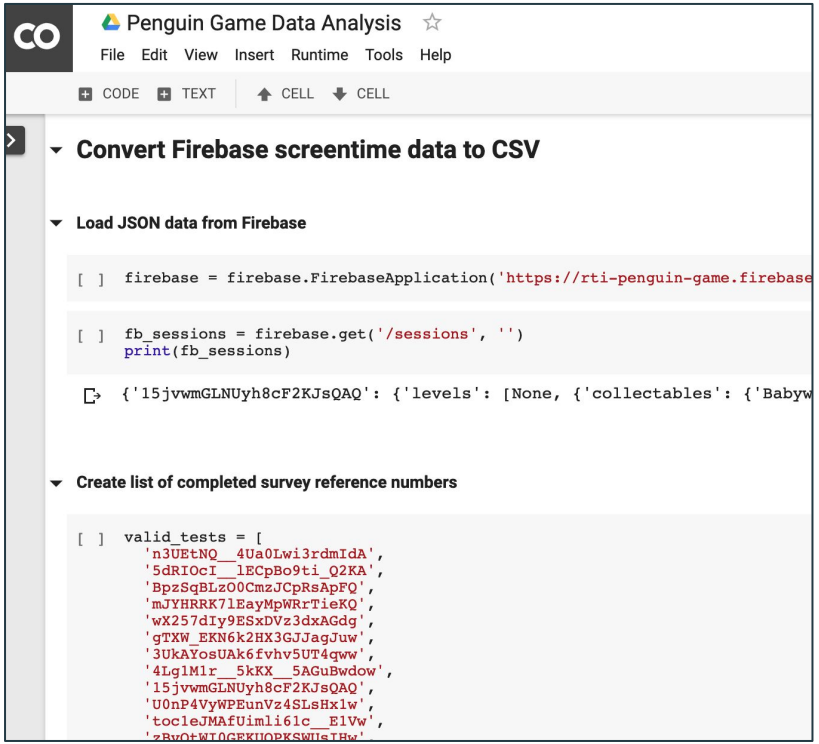
Realtime logging with Firebase

- Unique SESSION ID to link in-game logging with survey results
- Logged collect time and time on screen for each object in each level

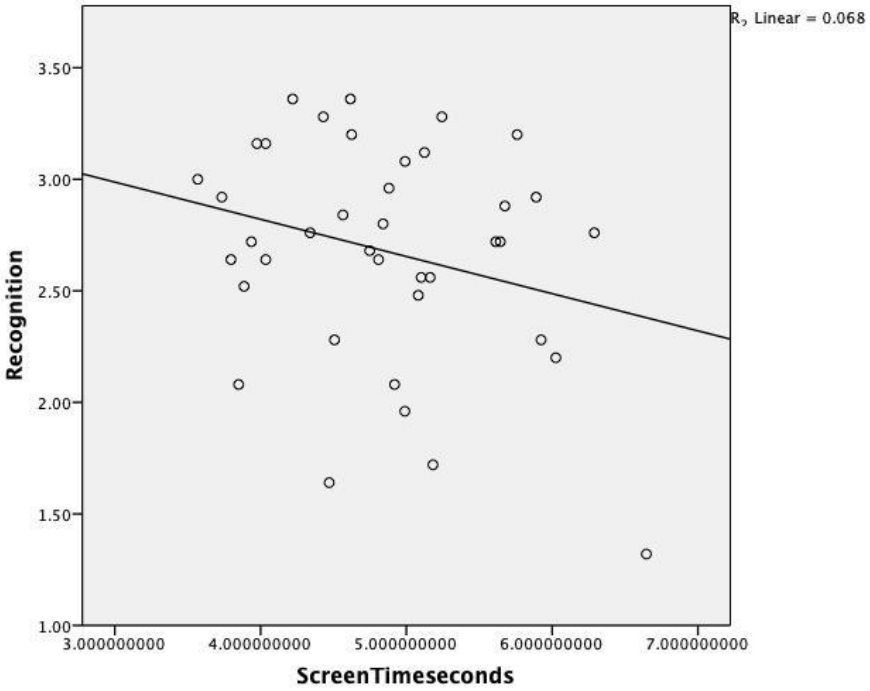


Analyzing Firebase data

Wrote a Colab Notebook to extract data from the Firebase API and write it to a CSV, which we fed into SPSS.



Spearman Correlation: Screen Time



Significance (1-tailed)

0.152

Spearman Correlation: Screen Time

		ScreenTime (sec)	Recognition
Spearman-Rho	Correlation Coefficient	1,000	-,169
	Sig. (1-tailed)		,152
	N	39	39

Conclusions

Conclusions

Our results are **not** strong enough to reject the null hypothesis and accept

H1: Recognition performance is positively correlated with semantic proximity

We actually detected the opposite trend:

Recognition performance seems to be **negatively** correlated with semantic proximity

People seem to remember better the objects that don’t fit the background

Discussion

Discussion

Although our results pointed to a certain trend, they weren't conclusive

Further research is needed

We didn't find a convincing semantic proximity model

We used and validated our own model

The semantic proximity results we got could be used in future studies

Thank you!