Curiosity Research Group

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Background

What is curiosity?

curiosity noun

Save Word

cu·ri·os·i·ty | \ ˌkyůr-ē-ˈä-s(ə-)tē, ˌkyər- \

plural **curiosities**

Definition of *curiosity*

1 : desire to know:

a : inquisitive interest in others' concerns : NOSINESS

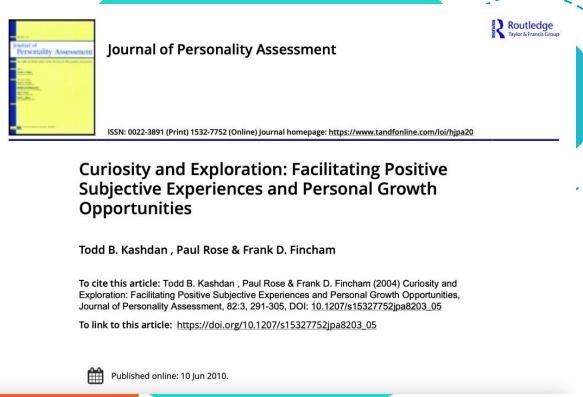
// The construction inside their house aroused the *curiosity* of their neighbors.

b : interest leading to inquiry

// intellectual *curiosity*

// Her natural *curiosity* led her to ask more questions.

Other Definitions of Curiosity/Previous Curiosity Research



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Curiosity and Exploration: Facilitating Positive Subjective Experiences and Personal Growth Opportunities

Todd B. Kashdan , Paul Rose & Frank D. Fincham

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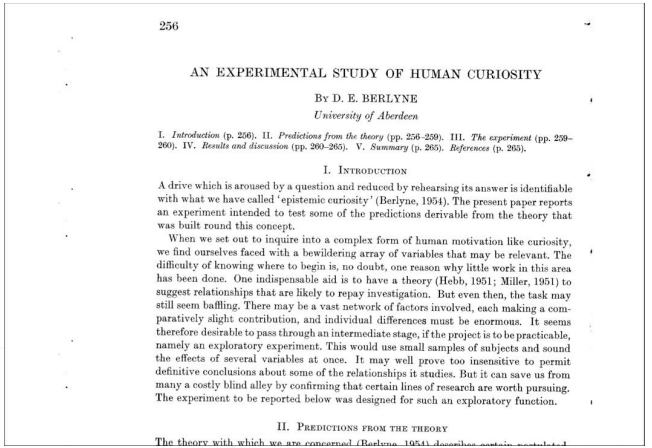

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AN EXPERIMENTAL STUDY OF HUMAN CURIOSITY

By D. E. BERLYNE
University of Aberdeen

I. *Introduction* (p. 256). II. *Predictions from the theory* (pp. 256–259). III. *The experiment* (pp. 259–260). IV. *Results and discussion* (pp. 260–265). V. *Summary* (p. 265). *References* (p. 265).

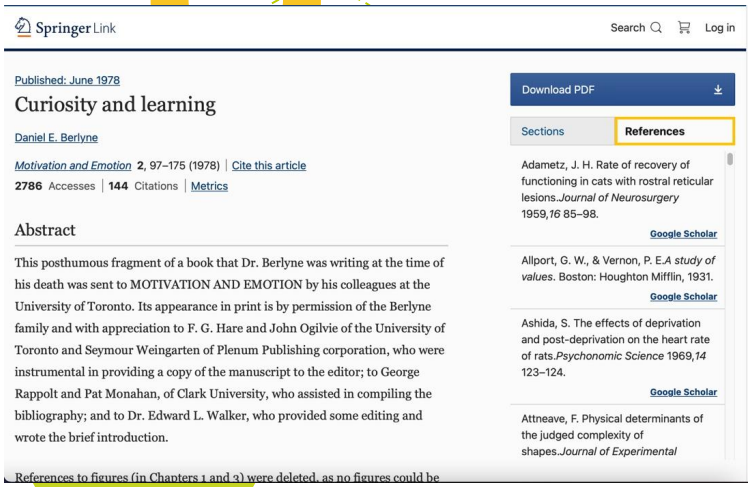
I. INTRODUCTION

A drive which is aroused by a question and reduced by rehearsing its answer is identifiable with what we have called 'epistemic curiosity' (Berlyne, 1954). The present paper reports an experiment intended to test some of the predictions derivable from the theory that was built round this concept.

When we set out to inquire into a complex form of human motivation like curiosity, we find ourselves faced with a bewildering array of variables that may be relevant. The difficulty of knowing where to begin is, no doubt, one reason why little work in this area has been done. One indispensable aid is to have a theory (Hebb, 1951; Miller, 1951) to suggest relationships that are likely to repay investigation. But even then, the task may still seem baffling. There may be a vast network of factors involved, each making a comparatively slight contribution, and individual differences must be enormous. It seems therefore desirable to pass through an intermediate stage, if the project is to be practicable, namely an exploratory experiment. This would use small samples of subjects and sound the effects of several variables at once. It may well prove too insensitive to permit definitive conclusions about some of the relationships it studies. But it can save us from many a costly blind alley by confirming that certain lines of research are worth pursuing. The experiment to be reported below was designed for such an exploratory function.

II. PREDICTIONS FROM THE THEORY

The theory with which we are concerned (Berlyne, 1954) describes certain postulated



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Published: June 1978

Curiosity and learning

Daniel E. Berlyne

Motivation and Emotion **2**, 97–175 (1978) | Cite this article

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Abstract

This posthumous fragment of a book that Dr. Berlyne was writing at the time of his death was sent to MOTIVATION AND EMOTION by his colleagues at the University of Toronto. Its appearance in print is by permission of the Berlyne family and with appreciation to F. G. Hare and John Ogilvie of the University of Toronto and Seymour Weingarten of Plenum Publishing corporation, who were instrumental in providing a copy of the manuscript to the editor; to George Rappolt and Pat Monahan, of Clark University, who assisted in compiling the bibliography; and to Dr. Edward L. Walker, who provided some editing and wrote the brief introduction.

References to figures (in Chapters 1 and 3) were deleted, as no figures could be

Adametz, J. H. Rate of recovery of functioning in cats with rostral reticular lesions. *Journal of Neurosurgery* 1959,*16* 85–98.
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Curiosity and well-being

Matthew W. Gallagher & Shane J. Lopez

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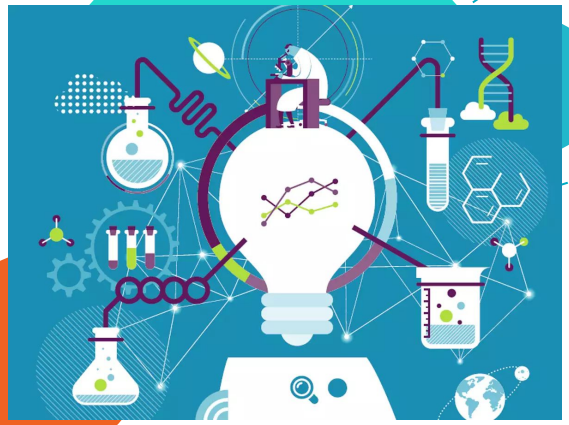
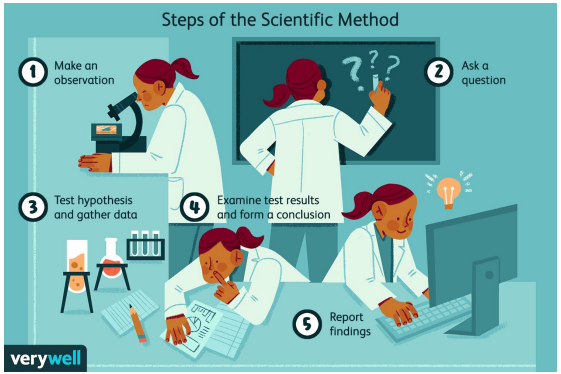


Why study curiosity?

- Curiosity is the basis of learning and development
- Curiosity is the basis of scientific research and discovery



What behavior does curiosity motivate?

- Exploration
- Risk Taking
- Collaboration

Primary Research Question:

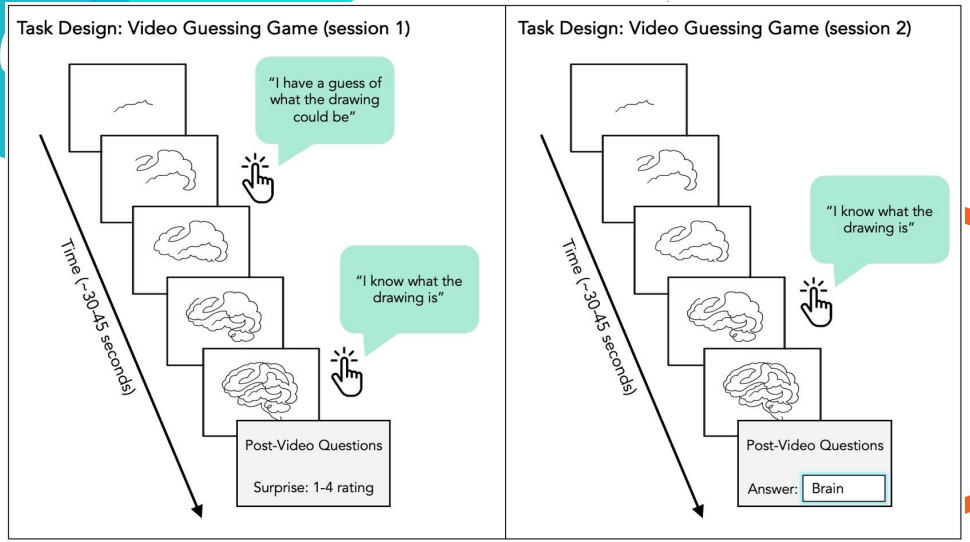
How does curiosity influence the way in which we interact with and process information?

Secondary Research Questions:

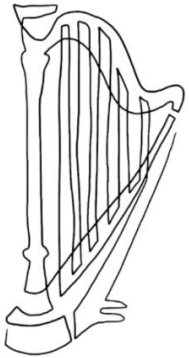
- What are the mechanisms that drive curiosity?
- Does curiosity impact memory?
- Does level of “surpringsinness” impact memory and the ability to recall information?
- People enjoy solving problems even when then there is no extrinsic reward. How do people experience resolution? Are there more “satisfying” types of resolutions?
- Are people more likely to recall items that involved a more “satisfying” problem-solving process?

Experiment

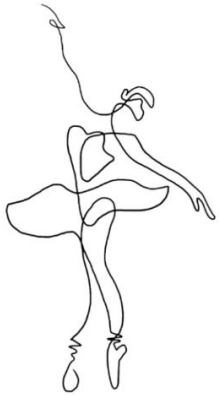
1. Participants placed in an FMRI machine in which they complete a survey completed in two parts
2. First part involves a series of video drawings in which the participant has to guess what the drawing is and rate how surprised they were by the outcome
3. The next day, participants have to recall the items they remember from the following day
4. Task begins again in which old and new video drawing videos are played
5. Participant must again guess what the drawing and– in addition to– have to state whether the video was new or old



The Experiment



Harp



Dancer

Scribble

Video Samples

Hypotheses

- People will remember surprising videos more than not surprising videos
- People will remember videos they find more curious than not
- The time between first guess and final guess will be positively related to surprisingness
- The higher the difficulty of a video, the more likely participants are to recall it
- If someone experiences a “eureka” moment, they are more likely to recall that video

Variables

- Independent Variables of interest:
  - Curiosity
  - Surprise element
  - Satisfaction
  - Video “difficulty”
  - Time till resolution
- Dependent variable:
  - Videos recalled

2

Data and Coding

Libraries

1. **Pandas**
   a. Data analysis and data frame manipulation
2. **Numpy**
   a. Math functions and random number generator
3. **Seaborn**
   a. Data visualization

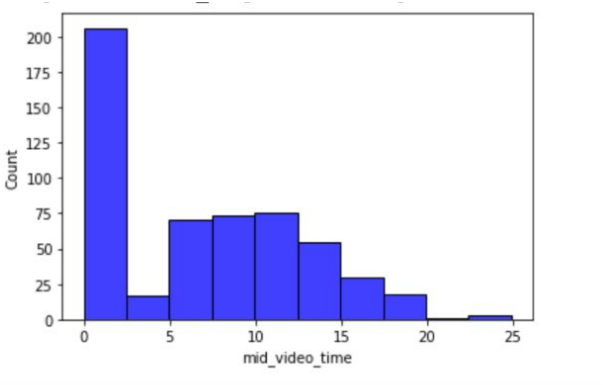
Goals

1. **Rework data into pandas dataframe**

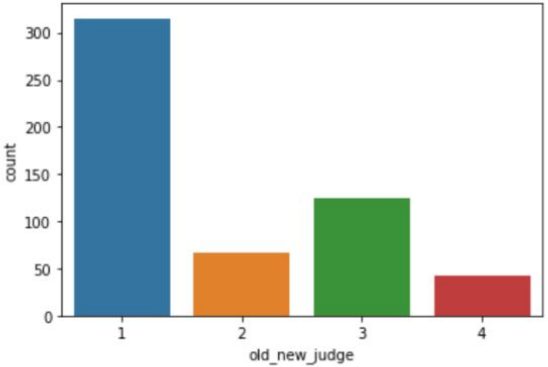
2. **Manipulate dataframes**
   a. Create new columns
   b. Delete unnecessary columns
   c. Filter data (subject or old/new)
   d. Merge data frames

3. **Create Data visualizations**
   a. Find relationships between variables

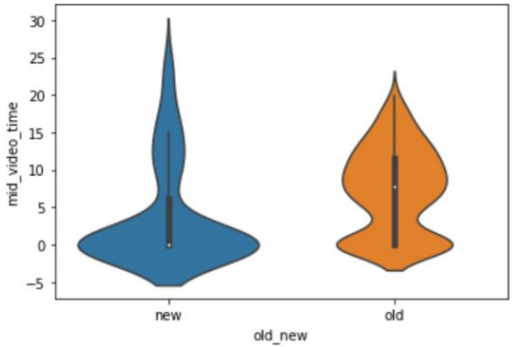
Creating Data Visualizations



Distribution of memory responses



How people were using the old-new scale



Spread of Participants' guessing time (old vs new videos)

3

Results and Discussion

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
 Family: binomial  ( logit )
Formula: recalled ~ f_eureka + s_curiosity + s_time_uncertain + f_run +
    s_surprise_rating + s_reveal_by_end + s_guess_correct + s_already_know +      (1 | subj)
   Data: data
Control: glmerControl(optimizer = "bobyqa", optCtrl = list(maxfun = 2e+05))

     AIC      BIC   logLik deviance df.resid
   162.0    197.9    -70.0    140.0      181

Scaled residuals:
    Min      1Q  Median      3Q     Max
-0.8972 -0.4178 -0.2740 -0.1598  4.7784

Random effects:
 Groups Name        Variance Std.Dev.
 subj   (Intercept) 0.3594   0.5995
Number of obs: 192, groups:  subj, 8

Fixed effects:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)       -1.729170   0.811994  -2.130   0.0332 *
f_eureka1          0.008253   0.784356   0.011   0.9916
s_curiosity       -0.727485   0.439356  -1.656   0.0978 .
s_time_uncertain   0.354648   0.324799   1.092   0.2749
f_run2            -1.101155   0.606324  -1.816   0.0694 .
f_run3            -0.418054   0.508283  -0.822   0.4108
s_surprise_rating -0.020871   0.292164  -0.071   0.9431
s_reveal_by_end   -32.227825  13.192233  -2.443   0.0146 *
s_guess_correct    32.667438  13.334290   2.450   0.0143 *
s_already_know    -0.410660   0.540678  -0.760   0.4475
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

- We ran a generalized multiple regression mixed model to investigate the relationship between our response variable (‘recalled’) and our multiple explanatory variables of interest (eureka, curiosity, time uncertain, run 2, run 3, surprise rating, revealed by the end, guess correct, already know).
  - f_eureka1: did the participant figure out the drawing by the end of the video
  - s_curiosity: average curiosity rating for video from separate sample of people
  - f_run2: run number 2 compared to run number 1 (of three run fMRI task)
  - s_reveal_by_end: % a measure of how difficult a video was by how likely a person was to figure out the video by the end (separate sample)
  - s_guess_correct: % of correct guesses compared to all guesses made (separate sample)

```
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---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

- **Statistically significant explanatory variables:**
  - S_guess correct
  - S_already_know
- **Visible Trends:**
  - S_curiosity
  - f_run2

```
Fixed effects:
                  Estimate Std. Error z value Pr(>|z|)
(Intercept)      -1.729170   0.811994  -2.130   0.0332 *
f_eureka1         0.008253   0.784356   0.011   0.9916
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---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```
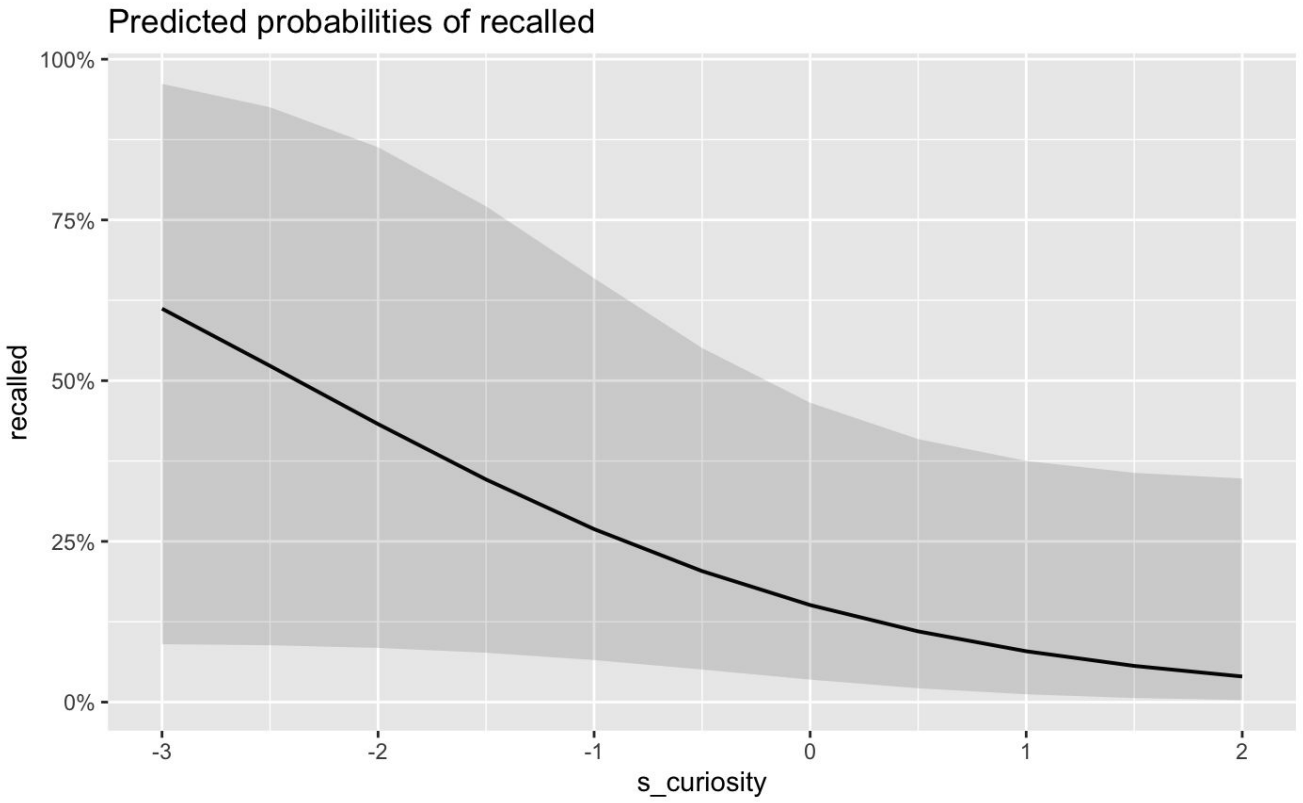

Interpretation

1. S_curiosity: as curiosity levels rise, participants are less likely to recall the video
2. F_run2: participants in round two show a decrease in ability to recall videos
3. S_reveal_by_end: the “easier” the video is to identify, participants are less likely to recall the video
4. S_guess_correct: the more correct guesses made by the participants about the video, the more likely they are to recall the video



- Main effect of curiosity on ability to recall video
- As curiosity increases, the probability of recalling the video decreases

Discussion

- Contrary to our hypothesis, the probability of recalling a video actually decreases when curiosity goes up. Interestingly, we also found no relationship between having a “eureka moment” and recall ability; thus, we found no support to demonstrate our prediction that a eureka moment would increase a participant’s ability to recall a video.
- We did not find a significant relationship between surprise and recallability which again counters our hypothesis that the more surprising a video is, the more likely a participant is likely to recall it.
- We also found that the less likely participants are able to guess the image before the answer is revealed, the more likely they are to recall it
- Surprisingly, we found that being in the second round of the experiment played a significant role in recall. Participants in the second round on average scored worse on the recall assessment. This could be due to the fact that participants are much less fatigued in the first round and in the third round participants are motivated by the fact this is the last round of the experiment, increasing their recall ability.

Why did we see these results?

- Our operationalization of curiosity does not have much internal validity?
- This data comes from only 10 participants! Many we will see different results when the study concludes!

4

Reflections

What we Learned:

Learned how to use programming to investigate behavior

Learned how to process, visualize and interpret behavioral and memory data

Learned how to use Pandas to code for behavioral data

Learned how to use R programming and regression models to investigate our research questions

Acknowledgements

Thank you Abby, Jia Hou and Adcock Lab!