

# Animism: a View of Probability Behaviour

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## Abstract

*One of childrens' views about 'what controls a Random Generator' has been defined in the literature as animism. This paper investigates and attempts to tabulate some of the definitions and explanations given by children in my current study, in an attempt to clarify their interpretation.*

## Animistic Responses

The study reported below was designed to ascertain children's ability to generalise the behaviour of similar Random Generators (RGs). A surprisingly large number of responses were animistic in form. Many children believed that there was a force, beyond their control, which determined the eventual outcome of an RG. Sometimes this force was God or some other external force, other times 'wishing or pleasing' the RG would produce the required response and on other occasions the RG itself 'knew' the result that the child wanted.

These beliefs come under the heading of animism which was introduced into empirical psychology by Piaget who defined a classification of four stages during which he observed 'the tendency among children to consider things as living and conscious' (Piaget, 1933). Bruner *et. al.* (1996) in their studies into cognition found evidence of animism. Because in their view, for young children, the visual appearance is a stronger cue, and they have not come to use language as a means of representing their world/

Other workers have reported the same phenomenon, not only in children. Fischbein *et. al.* (1991) described the responses of an adult student who was convinced that, in a chance game it is impossible to disregard the personal ability of the gambler. This personal

ability is the core of the game. The idea of pure chance had no meaning for this student. In the same study, They also reported responses from a study of children in grades 4 - 9. Some children observed that the outcome of the toss of a dice can be controlled by the individual. 'The mathematical, probabilistic structure has not yet been detached from the concrete circumstances and considered in its abstract generality'. In the same study some children are quoted as saying that if an event is rare it will not occur. Different methods or strategies have been described during interviews by other researchers. Green (1983) quoted 11-16 year old's referring to their best and worst numbers in choosing a number between 1 and 6.

Truran J. (1995) reports a belief by children as old as thirteen that a coin or a dice is subject to physical or mental powers. Langer (1975) sees an animistic conception by adults on the basis of the 'just world' hypothesis. 'Good things happen to people who do good things, and bad things happen to people who do bad things'.

The subject has been little examined despite earlier work. A description of the study methodology follows, after which I shall examine in more detail evidence of animism found there.

## Background to the Study

This study, involving group and individual testing of approximately 300 children aged from 7 - 14 years from a range of socio-economic areas, investigated children's perception of the behaviour of RGs. The study was carried out to inform researchers and primary teachers about children's perceptions of stochastics, especially in relation to RGs. This study is in line with the Chance & Data strand of the Curriculum Profiles now in place in South Australian schools.

One method of teaching probability favoured by many primary school teachers is for individuals to predict the results of using RGs, test and reconsider their prediction and then to compare individual results with those of the whole group. RGs are physical objects whose behaviour cannot be pre-determined or controlled. In this study, RGs that were used were coins, raffle tickets, 6 and 12 sided dice, spinners with 6 and 12 segments and urns containing 6 and 12 numbered table tennis balls. Throughout the study 'dice' was used for simplicity as many children were not familiar with the term 'die'.

### Study Details

Group tests were administered in a normal classroom situation; questions were asked about each RG separately and this was the only RG on display while the question was asked. Children wrote their responses onto prepared sheets with each question numbered and marked by a picture of the appropriate RG. Then individual interviews with six children randomly chosen from each of the Year 5 and 7 classes previously tested were conducted in a withdrawal room. Each child was interviewed individually and worked on the same prepared sheets and handled each RG at the appropriate time. Year 3 children were considered too young to cope with a group test, so six children were randomly selected from five Year 3 classes and interviewed individually. The following quotes come from these interviews.

### Findings

Some of the questions used in the study were taken from the literature while others were written especially for the study. The emphasis of the study was the children's beliefs about the behaviour of random generators. However, when questioned about the reasons for their answers many children reflected learned personal biases, superstitions and in some cases religious beliefs which indicated not just a perception of the behaviour of

RGs but more interestingly a perception of who or what is in control when a RG is operated. Some children viewed the RGs themselves as being in control of a situation, and believed that the RGs had the power to decide how they would behave in certain situations.

Some children believed that they had some control over the outcome of a RG: 'If I want it to come up heads I hold it on tails'. Others believed that there was some force beyond the RG that controlled its outcome: 'The hardest number to get is the number I want'. Some others who did not get the number or outcome that they predicted saw themselves as being 'at fault' and as having done something wrong.

Some children who had made predictions about the outcomes of a die which had did not eventuate said, 'it was my fault, I didn't throw it properly' - they did not go on to consider any other factor. The 'blame myself' theory came out strongly, across all age groups, throughout the study.

The children interviewed for this study frequently described this generalised force in what I have divided into four overall categories: subject centred (when 'I' have some control over the outcome of the RG), object centred (when some attribute or force, the shape or dimensions or type of RG have control, or a condition of chance influences the outcome).

Table One gives an overall picture of the perceptions that children have offered about the behaviour of various random generators. The headings are related to the child's perception of who or what has control; the quotes in the table have come from some children during the interviews and have been included because they represent one child's view. There were many other responses given throughout the study which presented similar views.

## **The outcome controlled by the child**

The way in which the RG is thrown, the side it starts on, the physical force or action that is used, a personal strategy that might be used to advantage, are all considered to be important to the eventual result. The children believe that they have control of the RG by using a particular strategy. The ability to mark a raffle ticket using a fingernail so that 'next time I will know what number is on it' was a strategy for controlling an RG albeit not immediately. Often mentioned was the view that everyone uses a different strategy when tossing a coin or dice and that this individuality can cause different results to occur.

BP (M 7:9)

I Is there any way that you can make a coin land on the face you want?

BP The way I hold it

I What do you mean?

BP If I hold it on this side [head] and throw it hard it always comes on tails. When I hold it on tails it comes on heads.

JL (M 8:4)

I Is there any way that you can make a coin land on the face you want?

JL Which angle you spin it - like when you start like this - [demonstrates]

What side it is on when I throw it.

POG (8:11)

I Is there any way that you can make a coin land on the face you want?

POG I remember where the numbers [sic] are before I throw it .

I How does that help you to make it land on the face you want?

POG It comes on the number opposite the one you started on.

I Does that always work?

POG Yes, all the time.

These are indications of a belief that there is a strategy, that if used correctly, will produce the result that is wanted. Even when the child demonstrated this strategy and the result was not that predicted the child was still not convinced that the method or belief was wrong - next time 'it' would work.

The belief that there is a correct way to hold a dice or coin, and that in order to get the number that you want you must practice was strongly believed by JP (F 8:8) even though she didn't get the result she wanted during the demonstration, she believed that with practice she eventually would do so.

I Why didn't it work?

JP Because I'm probably holding it wrong. You're meant to hold it on number twelve and number six.

I Is that between your thumb and finger?

JP Thumb and middle finger. Your middle finger is meant to be on twelve and your thumb on six [throws dice]

I Did that work?

JP Well no it takes practice and practice and practice, it takes pretty much time to get it on the number you want

## **An outside force(s)**

Some of those interviewed gave examples of their perception of the influence of God or some other force determining what might be a successful outcome.

CM (F 7:0)

I If I toss a coin will it come down heads or tails?

CM Tails

I Can we make the coin come down tails every time?

CM Yes.

I How can we do that?

CM You see God knows me really well, he's my bestest friend and If I say 'make it come down on tails' he will. Because he loves me and my wishes always come true.

AK (F 11:3)

I When you toss this dice is there a number or numbers that is harder to get or are all numbers the same?

AK I suppose with different people, when I play Yahtzee or something, I can hardly ever get a six. It's only if I'm really lucky. With some people they talk to the dice they say 'Please give me 6' and they get it.

KA (M 12:4)

I Is there anything you can do to get the number you want to come up?

KA Pray

I Do you think that works?

KA Sometimes.

### The RG Itself

RGs were considered to be strongly influential in the eventual outcome. Sometimes the influence comes from the RG itself which is credited with 'knowing'. At others the physical dimensions of the RG were considered to influence the outcome. Almost all children interviewed were unfamiliar with a dice or spinner having more than 6 sides or segments, accordingly they were more inclined to be influenced by the number of sides or segments.

AS (M 9:7)

are they all the same?

AS 1 is a pain in the neck I always get it

WD (F 7:9)

I If I toss this dice is there a number or number that is hardest to throw, or are they all the same?

WD It has a lot of angles so only one will come up

I Which one do you think that might be?

WD I don't know but it's only one, six sides are better I don't like this one.

VN (F 9:4)

I If I toss this dice is there a number or number that is hardest to throw, or are they all the same?

VN It has more sides than 6 so it's harder. It's probably 12 yeah 12 would be harder its the biggest number of sides so its 12.

RH (F12:3)

I When I toss this 12 sided dice is there any number or numbers that are harder to get than others?

RH Yes, nine is

I Why nine?

BH Because it's unlucky

I Well let's roll it and see what happens

*(Result from 3 rolls 9,9,3)*

I That's interesting - two nines and a three, do you still think nine is the hardest number to get?

RH Yes

I When 9 came up out of three rolls?

RH Because the dice knows that I hate that number and so rolled nine on purpose to annoy me!

### Chance

While some of the children interviewed considered that chance was responsible for an outcome this was sometimes qualified by the circumstances.

TR` (F 10:3) Since we're not playing a game I recon they will all have the same chance.

DD (F 11:2) The easiest number to get is the one you don't want.

M-AN (F10:5) I think all those numbers have the same chance because I don't know what the next number is. I think all the numbers have the same chance because this is a bigger dice [12 sided], it has more chance of getting even.

A factor that might not be classed as animism that was also prevalent during the interviews was the influence that the physical shape of a dice might have, or the comparison between e.g. a dice and a raffle ticket. Most of these children interviewed had not seen a 12 sided dice before and were interested in its shape, this observation was later commented on in most of the interviews. The different results likely to be obtained using e.g. a dice and a raffle ticket were often explained by the physical differences between them. 'This one's plastic and that one's paper - they'll be [sic] different'.

### Summary

This paper has provided information about children's beliefs about who or what controls a Random Generator. The force, defined as animism, is part of many children's strong belief structure for explaining the behaviour of RGs. This study has found that these beliefs are carried through to late primary school. These beliefs have a strong influence on the construct that children bring with them to a problem. The categories in the table are not absolute, and may not be strictly animism, but they do provide another way of interpreting children's responses and provide a starting point for a thoughtful researcher into a clearer understanding of children's locus of control of RGs and how this needs to be incorporated into the curriculum of probability.

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RG	The child	An outside force(s)	The RG itself	Chance
Coin	The way I hold it... (influences the result)	'God' causes required outcome.		
Dice	What side it is on when I throw it ... (influences the result)	It's just luck [ How much luck?] About half an inch.	I think all the numbers have the same chance because this is a bigger dice (12 sided) it has more chance of getting even.	I think all those numbers have the same chance because I don't know what the next number is.
	I 'please' the dice to get the number I want.	Sometimes I pray to get the number I want.		You just wish and if you don't get it it's just tough luck. If your wish comes true ... it's just your luck.
	I didn't throw it properly (to get the result I want)	The dice knows that is my unlucky number and made it come up on purpose.	The numbers near the 'top' might tip so are sometimes harder to get (12 sides)	Since we're not playing a game I reckon they will all have the same chance of coming up.
	It takes practice and practice and practice, it takes pretty much time to get the number you want.	If I'm not playing a game it's easier to get the numbers I want.	It's easier to get the numbers on the angles (12 sides)	
	Everybody throws dice a different way so everybody gets different numbers.			
	If I throw 3 dice at the same time they all rub together and that makes them come out with different numbers.			
Urn	I remember where the numbers are before I shake it.	Balls in certain physical positions in the urn are more likely to be drawn out		
Raffle Tickets	I can mark one with my fingernail when I take it out and then I know which number it is next time.	Tickets in certain physical positions in the container are more likely to be drawn out.	They are paper not plastic so they will (behave) differently	
Spinners		More segments make it harder to get a certain number.	Higher numbers are harder to get	
			It will be yellow this time, because it's yellow's turn.	