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ESTIMACION DE LA GRAVEDAD DE FALTAS Y DELITOS E INFLUENCIA SUBJETIVA EN LOS JUECES DE LOS ANTECENDENTES CRIMINALES

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Dos escalas destinadas a medir la gravedad de delitos fueron administradas a una muestra de 200 jueces. Se advirtió que el grado de influencia del antecedente responde a la magnitud del efecto de contraste que se produce al confrontar cada delito con un antecedente. Los valores de gravedad acumulada revelaron que el orden en que son cometidos los delitos afecta la objetividad de los jueces.

Two scales were used in order to measure the perceived seriousness of various types of crimes. Judgements were made by 200 subjects. The effect of an antecendent event or crime was related to the magnitude of the contrast produced by comparing it with a subsequent crime. The order in which crimes are committed had an effect on the cummulative perceived seriousness.

Sobre la base de una lista de once acciones delictivas extraídas de Sellin & Wolfgang (1964) y empleadas por H. Donnelly (1967) en medición de variables psicológicas, se han construido dos escalas. Ellas responden a los objetivos primordiales seguidos por Rimoldi y López Alonso (1972) en el estudio de relaciones entre juicios simples y condicionados.

La primera de las escalas está destinada a estimar juicios simples, pues en ella se solicita a los sujetos (jueces) que evalúen la gravedad de un único acto delictivo cometido por una persona ("el ofensor"). No se da ninguna otra referencia sobre el autor del hecho, de modo que los jueces juzguen sólo el hecho en sí obviando toda otra información al respecto.

La segunda escala está construida con los mismos actos delictivos pero está destinada a estimar juicios condicionados, pues en ella se pide a los jueces que juzguen un estímulo frente a una determinada condición. Cada uno de sus ítems presenta dos actos delictivos, uno presentado como "delito actual", éste es el último delito cometido por el ofensor y constituye el estímulo a ser juzgado; el otro, es presentado como un antecedente perteneciente al pasado judicial del ofensor y constituye la condición. Sólo el delito actual es el que debe ser juzgado, pero al hacerlo debe tenerse en cuenta el antecedente. Se indica especialmente a los jueces que el antecedente es un delito que no deben juzgar pues el ofensor ya ha cumplido la pena que le corresponde ante la ley.

El objetivo de la primer escala es juzgar un hecho delictivo in abstracto o per se, exento de toda circunstancia. El objetivo de la segunda escala, es juzgar los mismos delitos bajo la impresión dejada por un antecedente. De este modo, se trata de averiguar si los antecedentes judiciales cumplidos ante la ley, influyen de alguna manera y en qué medida sobre la gravedad de los delitos que los reincidentes cometan a-posteriori. Ello se estimará en base a los siguientes supuestos:

a) Las estimaciones de los jueces se expresan cuantitativamente por el método de intervalos sucesivos, y a partir de las mismas se obtienen los siguientes estadísticos en términos generales: M_j ó M_k son las medias de los juicios simples (primera escala) otorgados a los hechos delictivos j ó k dados como eventos simples. $M_{j/k}$ representa a la media del juicio condicionado dado al delito actual j frente al antecedente k.

Siendo $M_{j/k}$ la media de cualquier juicio condicionado, $M_{j/.}$ representa la media de todos aquellos juicios condicionados dados al mismo estímulo j. El punto a la derecha de la barra en el subíndice $j/.$ indica que la condición varía. Cada conjunto de valores $M_{j/k}$ que se define por tener el mismo estímulo, se designa familia de estímulo constante. De manera similar, si reunimos a los juicios condicionados que tienen la misma condición k, en los cuales varía el estímulo, formamos una familia de condición constante, cuya media se representa por $M_{./k}$.

b) La independencia del juicio dado el estímulo j respecto al antecedente k, se expresa

$$M_{j/k} = M_j$$

es decir, si la estimación del juicio condicionado de j no difiere significativamente de su juicio como estímulo simple, es independiente de la condición. Por el contrario, será dependiente si la diferencia es significativa. Si ello es así, pueden darse entonces dos posibilidades: que $M_{j/k}$ sea menor que M_j, en cuyo caso la condición tiene el efecto de disminuir el juicio del estímulo j (efecto de contraste negativo). La otra posibilidad es que $M_{j/k}$ sea mayor que M_j, en cuyo caso la condición tiene el efecto de aumentar el juicio de j, lo cual constituye un efecto de contraste positivo.

c) Dado que todas las estimaciones de los jueces en ambas escalas constituyen grados de gravedad asignados a distintos delitos en diferentes alternativas interesa distinguir: *Gravedad intrínseca:* es la gravedad otorgada a todo delito juzgado per se o gravedad de cada juicio simple. Su valor está dado por M_j ó M_k. *Gravedad condicionada:* es la gravedad otorgada a todo delito cuando es juzgado teniendo en cuenta uno o más antecedentes judiciales del autor. Su valor está dado por $M_{j/k}$ o por $M_{k/j}$ alternativamente. *Gravedad acumulativa:* es el monto de gravedad que acumula una persona a lo largo de su vida, sumando a la gravedad intrínseca de su primer delito la gravedad condicionada de sus delitos posteriores teniendo siempre en cuenta sus antecedentes. Su valor está representado por la suma gravedad intrínseca del antecedente primero (M_k) más la gravedad condicionada de su segundo delito j juzgado sobre la base del antecedente ($M_{j/k}$). La suma seriada ($M_k + M_{j/k} + M_{s/jk} + \ldots$) puede correlacionarse definidamente con el monto de tiempo de condenas sumadas por el reincidente correspondiente al orden k, j, s, . . ., pero interesa saber también si las variaciones en el orden (por ejemplo s, k, j, . . .) de un mismo conjunto de delitos, determina diferencias entre las gravedades acumulativas correspondientes a cada una de las diferentes secuencias, como asimismo entre los montos de condenas correlativos. La comparación entre los valores de gravedades acumulativas permite preestablecer las siguientes posibilidades:

Si ambos delitos son mutuamente independientes, entonces debe cumplirse que ($M_k + M_{j/k}$) = ($M_j + M_{k/j}$) = ($M_j + M_k$). O bien puede ocurrir que sean interdependientes y que ejerzan ellos un efecto de contraste similar, en este caso tendremos que ($M_k + M_{./k}$) = ($M_j + M_{k/.}$) ≠ ($M_j + M_k$). Pero si tenemos por ejemplo que ($M_k + M_{j/k}$) es mayor que ($M_j + M_{k/j}$) esta desigualdad nos indica que el antecedente k ejerce un efecto de contraste positivo mucho más acentuado sobre la gravedad de j, que el efecto que puede tener j como antecedente sobre el delito actual k. Si la relación anterior se cumple, confirma nuestra hipótesis de que un delito determinado puede tener un peso significativamente distinto cuando se lo juzga en un delincuente primario que cuando se lo toma en cuenta como antecedente en un reincidente, y que el antecedente puede

representar un facto psicológico muy especial en lo que respecta a juicios de gravedad de otros delitos. Un aspecto muy importante, es que la desigualdad dada antes puede determinar también la desigualdad en la condena total que han de cumplir dos reincidentes en los mismos delitos cometidos en distinto orden, ya que los juicios de gravedad no dependerían del contenido intrínseco de cada delito, sino del significado criminológico del orden en que fueron cometidos. Cada vez que tal tipo de desigualdad se cumple, tendremos a dos reincidentes que habiendo cometido los mismos delitos, cumplen condenas distintas. Si dicho factor psicológico prevalece en el juicio humano aun a través de la objetividad de los jueces, cabe preguntarle a la jurisprudencia sobre los valores de justicia que se verían afectados por el mismo.

El único factor que da cuenta de la diferencia dada arriba es el orden en que se han cometido los delitos, por lo tanto la diferencia $(M_i + M_{jk}) - (M_j + M_{ki})$ estima un *efecto de orden*. La suma $(M_i + M_{jk})$ representa el promedio de gravedad acumulativa correspondiente a la familia de juicios de condición constante k; es decir, el promedio de todos los diferentes delitos que registran el mismo antecedente. El término dado arriba se empleará para comparar el efecto de variar el antecedente dentro de un mismo conjunto de delitos actuales.

La diferencia existente entre distintos términos M_{jk} tomados de a dos brindará una estimación del efecto de orden provocado por poner al antecedente k en primer lugar respecto a los demás delitos. Se sobreentiende que k varía para cada familia de condición constante.

Método

Ambas escalas han sido suministradas una a continuación de la otra a una muestra independiente de doscientos jueces, todos ellos personas adultas, de distinto sexo, edad, nivel de instrucción y profesión; algunos de ellos abogados o estudiantes de abogacía.

La primera de las escalas, de juicios simples, presentaba los siguientes items, cada uno de ellos transcrito sobre una tarjeta de cartulina blanca de 8 x 12 cm:

Nº de Código	Item
6	"El ofensor transita por la vía pública en estado de ebriedad".
26	"El ofensor hace un intento de suicidio"
5	"Al ofensor se lo encuentra disparando con un rifle para el cual no cuenta con permiso especial"
19	"El ofensor se niega a pagar el alquiler del departamento"
30	"El ofensor destruye un libro perteneciente a una biblioteca"
23	"El ofensor expone sus genitales en público"
24	"El ofensor comete bigamia"
10	"El ofensor viola la entrada a un domicilio, fuerza una caja fuerte y roba el dinero"
7	"El ofensor mata a una persona, al manejar desaprensivamente"
2	"El ofensor fuerza a una mujer a someterse a comercio sexual"
1	"El ofensor mata a una persona de una puñalada"

La segunda de las escalas, de juicios condicionados, se construyó con los once items anteriores, los que fueron tomados en variaciones de a dos y transcritos alternativamente uno como delito actual y el otro como antecedente delictivo en tarjetas de

cartulina blanca de 12 × 16 cm. De este modo se compusieron 121 ítems de estímulos condicionados.

las instrucciones impartidas a los jueces responden a los objetivos vertidos en la sección anterior. En ambas escalas, se les solicitó que evaluaran la gravedad del delito a ser juzgado en términos numéricos de 1 a 11 puntos, reservando en lo posible los 11 puntos sólo para aquellos delitos que consideraran de extrema gravedad.

Resultados

La Tabla 1 contiene todos los resultados obtenidos de cada una de las escalas. Las celdas de la matriz de 11 × 11 ubicada en el ángulo superior izquierdo, contienen los distintos valores de medias de juicios condicionados $M_{j/k}$. Para identificar a qué juicio corresponde cada uno de estos valores, el lector deberá tomar en cuenta sobre qué hilera y sobre qué columna está ubicada cada celda. El número de código que encabeza a cada hilera identifica el estímulo que está presentado como delito actual; en tanto que los números de código que encabezan a cada columna identifican a esos mismos delitos cuando operan como antecedentes.

Los valores $M_{j/k}$ que se encuentran alineados a lo largo de una hilera representan a una familia de estímulo constante, pues todos ellos poseen el mismo delito actual frente a distintos antecedentes. De igual manera, los valores asentados a lo largo de cada una de las columnas definen a una familia de condición constante, pues todos ellos representan a distintos estímulos presentados frente a una misma condición.

Al fin de cada hilera, se dan valores estadísticos correspondientes al conjunto que integra cada familia de estímulo constante. En las columnas encabezadas por M_i y M_j figuran las medias de cada familia de estímulo constante y su respectiva desviación estándard. En la columna M_j están dadas las medias de juicios simples (primera escala) correspondientes a los estímulos que encabezan las hileras. La columna $b_{j/}$ da el valor del coeficiente de regresión de la ecuación que relaciona linealmente al conjunto de valores dados en cada hilera con las medias de juicios simples de cada uno de sus antecedentes. Es decir, es la relación lineal establecida entre los valores de cada hilera de estímulo constante con la hilera lateral encabezada por M_k al pie de la matriz.

Además de la hilera lateral M_k, por debajo de la matriz, están las hileras encabezadas $M_{j/k}$, en la que se dan las medias de cada familia de condición constante; $s_{M_{j/k}}$, en las que figuran las desviaciones estándard de cada una de dichas familias, y la hilera $b_{j/k}$ en la que se registran los valores del coeficiente de regresión correspondiente a la relación lineal establecida entre los valores de cada familia de condición constante con los de la columna lateral M_j.

Los coeficientes de regresión $b_{j/}$ y $b_{j/k}$ han sido empleados en la medición de distintos efectos de contraste (López Alonso, 1973 y 1974) y en la determinación del grado de dependencia de un estímulo respecto de una condición (Rimoldi & López Alonso, 1975). Si dentro de una familia de estímulo constante, el estímulo permanece inalterable respecto a su valor de juicio simple frente a cada uno de los antecedentes, es independiente de todos ellos, y en ese caso $b_{j/}$ será igual a cero. En la medida en que $b_{j/}$ difiera significativamente de cero, estimará el grado de un efecto de contraste negativo si tiene signo menos, y estimará un efecto de contraste positivo en la medida en que su valor difiera positivamente de cero. Si dentro de una familia de condición constante, el antecedente k no altera los valores de los estímulos, ellos son independientes de dicha condición, y el valor del coeficiente $b_{j/k}$, en este caso, no diferirá significativamente del valor 1.00. En el caso de que el valor de $b_{j/k}$ es significativamente mayor que uno, ello indica que el efecto de contraste (negativo o positivo) recae con mayor intensidad en uno

Tabla 1
MEDIAS DE JUICIOS CONDICIONADOS

Delitos actuales:	Antecedentes: 6	26	5	19	30	23	24	10	7	2	1	$M_{j\cdot}$	$_sM_{j\cdot}$	M_j	$b_{j\cdot}$
6	4.46	4.04	4.82	4.44	4.45	5.02	4.72	5.19	6.19	5.69	5.89	4.99	.65	3.39	.27
26	4.48	4.58	4.69	4.44	4.79	4.95	4.89	4.83	5.45	5.53	5.71	4.04	.41	4.17	.18
5	5.37	4.99	5.59	5.26	5.34	5.50	5.47	5.96	7.00	6.48	7.38	5.85	.74	4.20	.31
19	5.05	4.49	5.11	5.54	5.24	5.36	5.30	6.06	6.00	6.11	6.21	5.50	.52	4.79	.21
30	5.33	5.13	5.89	5.52	6.17	5.77	5.65	6.44	6.53	6.29	6.31	5.91	.45	5.62	.17
23	5.74	5.37	5.92	5.73	5.71	6.11	6.16	6.09	6.00	6.99	6.71	6.10	.47	5.92	.20
24	6.32	5.89	6.44	6.26	6.41	6.62	7.07	6.72	7.19	7.65	7.19	6.70	.49	6.44	.20
10	6.85	6.41	6.92	7.14	7.31	7.13	7.13	8.10	7.80	8.22	8.14	7.38	.57	6.96	.24
7	9.28	8.64	9.26	8.85	9.08	9.04	9.11	9.28	10.17	9.70	9.93	9.30	.44	9.06	.16
2	8.76	8.46	8.89	8.84	8.97	9.15	9.11	9.18	9.40	9.71	9.85	9.12	.39	9.48	.17
1	9.85	9.52	10.00	9.90	9.87	10.00	10.15	10.14	10.43	10.48	10.65	10.10	.31	9.82	.13
$M_{\cdot k}$	6.50	6.14	6.69	6.54	6.67	6.79	6.80	7.09	7.52	7.53	7.63				
$_sM_{\cdot k}$	1.85	1.80	1.80	1.80	1.79	1.73	1.80	1.71	1.64	1.68	1.68				
M_k	3.39	4.17	4.20	4.79	5.62	5.92	6.44	6.96	9.06	9.48	9.82				
$b_{\cdot k}$	.84	.82	.81	.82	.82	.79	.82	.77	.71	.76	.73				

Tabla 2

VALORES DE GRAVEDAD ACUMULATIVA ($M_k + M_{j/k}$)

Delito actual												M_j
	6	7.85	8.21	9.02	9.23	10.07	10.94	11.16	12.15	15.25	15.17	15.71	3.39
	26	7.87	8.75	8.89	9.23	10.41	10.87	11.33	11.79	14.51	15.01	15.53	4.17
	5	8.76	9.16	9.79	10.05	10.96	11.42	11.91	12.92	16.06	15.96	17.20	4.20
	19	8.44	8.66	9.31	10.33	10.86	11.28	11.74	13.02	15.66	15.59	16.03	4.79
	30	8.72	9.30	10.09	10.31	11.79	11.69	12.10	13.40	15.59	15.77	16.13	5.62
	23	9.13	9.54	10.12	10.52	11.33	12.03	12.60	13.05	15.66	16.47	16.53	5.92
	24	9.71	10.06	10.64	11.05	12.03	12.54	13.51	13.69	16.25	17.13	17.01	6.44
	10	10.24	10.58	11.12	11.93	12.93	13.05	13.57	15.06	16.86	17.70	17.96	6.96
	7	12.67	12.81	13.46	13.64	14.70	14.96	15.55	16.24	19.23	19.18	19.75	9.06
	2	12.15	12.63	13.09	13.63	14.59	15.07	15.55	16.14	18.46	19.19	19.67	9.48
	1	13.24	13.69	14.29	14.68	15.49	15.92	16.59	17.10	19.49	19.96	20.47	9.82
$(M_k + M_{j/k})$		9.89	10.31	10.89	11.33	12.29	12.81	13.24	14.05	16.58	17.01	17.45	
M_k		3.39	4.17	4.20	4.79	5.62	5.92	6.44	6.96	9.06	9.48	9.82	

gravedad intrínseca del antecedente. A través de estos resultados puede concluirse que los delitos ubicados en el extremo inferior de la escala de gravedad intrínseca son los más sensibles al efecto de contraste positivo provocado por los antecedentes correspondientes al extremo opuesto de la misma escala.

Puede estipularse entonces que la gravedad condicionada de un delito aumenta en la medida en que su gravedad intrínseca es excedida por la gravedad intrínseca del antecedente. Esta regularidad puede acentuarse sensiblemente en algunos casos especiales debido al realce en el sentido criminológico que puede adquirir un delito al atribuírsele un determinado antecedente. La intensidad de este realce es un producto psicológico de la impresión que causa en los jueces la conjunción de ambos delitos en la autoría de una misma persona; es decir que los jueces al conocer un antecedente del autor ya no juzgan un hecho delectivo aisladamente o in abstracto, sino que evalúan una conjunción interdependiente de delitos y no una sucesión de hechos aislados e independientes como lo hacían al juzgar cada una de las tarjetas de la escala de eventos simples. En la Tabla 1, por ejemplo, el delito código Nº 5 (hacer uso de un arma sin permiso especial) considerado aisladamente reviste el sentido de una simple infracción, pero adquiere un significado de peligrosidad cuando se los conjuga con antecedentes del autor que ponen en evidencia sus tendencias alevosas o su irresponsabilidad. El efecto de contraste positivo padecido por este delito ha sido $b_5 = .31$, el más alto de la escala.

La regularidad en el incremento del efecto de contraste positivo provocado por la confrontación con un antecedente de gravedad relativamente mayor, hace necesario considerar sus consecuencias sobre la gravedad acumulativa. De acuerdo a los resultados obtenidos, para dos delitos iguales, la gravedad acumulativa es distinta según el orden en que fueron cometidos por su autor. Si el efecto de contraste positivo es más intenso cuanto más grave es relativamente el antecedente, es lógico pensar qué delito ha sido cometido primero, pues el orden determina que la gravedad acumulativa involucre en uno de sus sumandos un efecto de contraste más fuerte o más débil según el caso.

La gravedad acumulativa es siempre la suma de una gravedad intrínseca más una gravedad condicionada, por tanto siempre será la más alta aquélla cuyo segundo sumando corresponda al delito condicionado que padezca el efecto de contraste positivo más fuerte. El poder medir la magnitud del efecto de contraste, puede explicar en este caso por qué el orden de los sumandos sí altera el producto; o tal vez explicite otro fenómeno obscuro como el preconcepto gestáltico de que "el todo es siempre más que la suma de sus partes" (sobre todo si las partes son tomadas siempre como eventos simples).

Si bien es justo que todo juez objetivo haga sus juicios sobre los delitos que el reo ya haya cometido y no sobre los "que aún habrá de cometer", la excesiva influencia que puede adquirir un antecedente abre un interrogante con respecto a su valor de justicia y objetividad. Un individuo que ha matado a otra persona en el pasado de su vida y hoy es detenido por destruir un libro de una biblioteca, merece de acuerdo a la "lógica" de la gravedad acumulativa una condena mayor que aquel otro individuo que destruyó ayer un libro y hoy es procesado por haber matado a una persona. Es de advertir que esta tendencia subjetiva de los jueces se halla en franca oposición con las tendencias a la readaptación social de los reincidentes, en el sentido de que todo reincidente que comete delitos cada vez más graves es potencialmente el más peligroso.

Referencias

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Tabla 3
DIFERENCIAS ENTRE GRAVEDADES ACUMULATIVAS PARA DOS DELITOS EN DISTINTO ORDEN (DIFERENCIAS $(M_k + M_{j/k}) - (M_j + M_{k/j})$)

j \ k	6	26	5	19	30	23	24	10	7	2	1	M_j
6		.34	.26	.79	1.25	1.81	1.45	1.91	2.58	3.02	2.47	3.39
26			—.27	.57	1.11	1.33	1.27	1.21	1.70	2.38	1.84	4.17
5				.74	.87	1.30	1.27	1.80	2.60	2.87	2.91	4.20
19					.55	.76	.69	1.09	1.42	1.96	1.34	4.79
30						.36	.06	.47	.89	1.18	.64	5.62
23							.06	.00	.70	1.40	.61	5.92
24								.11	.70	1.58	.42	6.44
10									.62	1.56	.86	6.96
7										.72	.26	9.06
2											—.29	9.48
1												9.82
M_k	3.39	4.17	4.20	4.79	5.62	5.92	6.44	6.96	9.06	9.48	9.82	

de los extremos de la escala de juicios simples. Si su valor es menor que uno y el efecto de contraste es positivo, ello significa que la condición en cuestión afecta más sensiblemente a los delitos actuales de menor gravedad (López Alonso, 1974).

Se ha verificado que los valores de los coeficientes de regresión $b_{j/}$ y $b_{/k}$ dependen directamente del valor del juicio simple respectivo, es decir M_j y M_k respectivamente, o bien del orden que guardan dichos juicios simples dentro del conjunto de evaluaciones simples que se hayan hecho en una escala (López Alonso, 1974).

Respondiendo a una disposición similar a la de la Tabla 1, la Tabla 2 registra en cada una de sus celdas los valores de gravedad acumulativa dados por los términos $(M_k + M_{j/k})$.

En el margen inferior de esta tabla, alineados bajo cada una de las columnas correspondientes a una familia de condición constante, figuran las medias de cada una de estas familias, $(M_k + M_{/k})$ y los valores M_k respectivos.

La Tabla 3 responde a la misma disposición de las dos tablas anteriores, pero contiene en cada una de sus celdas la diferencia existente entre los términos $(M_k + M_{j/k}) - (M_j + M_{k/j})$. Estas diferencias estiman el efecto del orden en que fueron cometidos dos delitos iguales. La tabla registra solamente los valores correspondientes al sector que se encuentra por encima de la diagonal principal, ya que en este caso se trata de una matriz antisimétrica y el sector aludido es el que corresponde a las diferencias positivas.

La Tabla 4 consta de una sola hilera. En cada una de sus celdas se registran los valores obtenidos mediante la siguiente operación $(M_j + M_{j/j}) - (M_j + M_j)$ lo que es equivalente a decir $(M_{j/j} - M_j)$. Esta diferencia representa el efecto que tiene sobre la gravedad acumulativa el hecho de que un reincidente reitere siempre el mismo delito; es decir, lo que se ha denominado reincidencia específica.

Tabla 4
DIFERENCIAS $(M_{j/j} - M_j)$ PROVOCADAS POR EL EFECTO DE REINCIDENCIA ESPECIFICA

j:	6	26	5	19	30	23	24	10	7	2	1
$(M_{j/j}-M_j)$:	1.07	.41	1.39	.75	.55	.19	.63	1.14	1.11	.23	.83
M_j	3.39	4.17	4.20	4.79	5.62	5.92	6.44	6.96	9.06	9.48	9.82

Discusión

Las hileras y las columnas de las Tablas 1, 2 y 3 están encabezadas por el número de código que corresponde a cada uno de los delitos de la escala, pero tanto las hileras como las columnas se suceden entre sí siguiendo el orden de los valores de medias simples correspondientes, dados en la columna M_k según el caso. Este ordenamiento permite visualizar mejor cómo covarían los valores inscritos en las celdas con los valores de medias de gravedad intrínseca, según se los observe a lo largo de una hilera o bien a lo largo de una columna.

Las mismas variaciones en los valores de los coeficientes de regresión $b_{j/}$ y $b_{/k}$ demuestran que la intensidad del efecto de contraste que un mismo conjunto de delitos puede padecer frente a una determinada condición, depende de la mayor o menor

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GERAÇÃO ALEATÓRIA DE TRIGRAMAS CVC POR COMPUTADOR

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O presente trabalho focaliza dois problemas originados nos estudos iniciais de Ebbinghaus sobre a memória: a elaboração de listas de trigramas CVC contendo grande volume de unidades, e a organização dessas unidades segundo certas regras formais. Sugere-se uma solução através do uso de computador.

Two problems originated in Ebbinghaus's pioneer work on memory are studied in this paper: the production of CVC trigram lists having a large number of units, and the organization of these units according to formal rules. A solution by computer is proposed.

Neste trabalho sugere-se uma solução para dois problemas relativos à elaboração de listas de sílabas sem sentido.

Archer (1960) assinala a incongruência de perpetuar-se um paradoxo que se criou espontaneamente - falar sobre o "sentido" das sílabas ditas "sem sentido", propondo chamar-se a essas combinações de trigramas, e pela sua forma, especificá— las ainda mais como trigramas CVC. Aqui, entretanto, serão tratados alguns aspectos que remontam à invenção desse material, razao pela qual foi mantida, no texto, a nomenclatura tradicionalmente consagrada na literatura.

Os problemas mencionados são a necessidade de material em grande quantidade e a organização das unidades componentes segundo certas regras. Através da utilização de computador, propõe-se um método de geração de listas pelo qual o número de combinações entre os elementos das mesmas é praticamente infinito, permitindo, ainda, a execução automática de quaisquer restrições de caráter formal.

Influenciado tanto pelo associacionismo inglês quanto pela tradição da ciencia natural alemã, ocorreu a Hermann Ebbinghaus a possibilidade da aplição ao estudo dos processos superiores da mente da abordagem contida nos Elementos de Psicofísica de Fechner (1889). Ao abrir a possibilidade ao estudo quantitativo da memória, Ebbinghaus estava respondendo à principal crítica levantada contra a Psicologia Experimental da época, acusada de restringir-se apenas a processos periféricos.

A proposta da psicofísica clássica era o estabelecimento de relações funcionais ou de dependência entre o corpo e a mente, através de uma teoria exata, e de maneira mais geral, entre o mundo físico e o mundo psíquico. Durante largo tempo essa perspectiva norteou os trabalhos da Psicologia Experimental, através da medida de limiares absolutos e relativos, baseados principalmente na chamada Lei de Weber-Fechner.

A idéia de limiar absoluto é clara no raciocínio de Ebbinghaus (1885, p. 8) sobre a recuperação de uma informação de memória: "Aquí existe apenas uma alternativa: uma reprodução é possível ou não é possivel; o corre ou não acorre. Admitimos que possa aproximar-se, sob diferentes condições, da ocorrência real, de modo que na sua exiiência subliminar a série possua diferenças graduais. Mas enquanto limitarmos nossas observações àquilo que por acaso, ou por apelo da nossa vontade daia desse domínio interno, todas essas diferenças são para nós inexistentes".

Além do contínuo físico e do contínuo da sensação, a indicação de limiares depende

de um continuo de julgamento. A psicofísica clássica procurou contornar esse problema mantendo a sensação e o julgamento englobados, pela utilização de Sujeitos altamente treinados, exatamente o que levou Ebbinghaus a ser seu próprio e único Sujeito. A explicitação desses contínuos, permitindo controlar os fatores motivacionais e o critério do Sujeito somente seria levada a cabo pela Teoria da Deteção do Sinal (Luce, 1959, Restle, 1961).

Teórico eclético, Ebbinghaus extendeu a lógica básica da medida psicofísica à quantificação do grau de retenção, enfrentando experimentalmente a problemática originada pelos empiristas e associacionistas. O conhecimento, para estes, surgiria da experiência. Não existiriam idéias inatas, e a experiência com o mundo seria um requisito à formação de idéias simples. Essas seriam, então, ligadas em unidades mais complexas por associação. Estudando suas próprias experiências através da introspecção, os associacionistas não se propunham a comprovar a formação dessas idéias, sugerindo apenas a existência de leis que regeriam tais ligações. Ao inventar a sílaba sem sentido, Ebbinghaus buscava unidades, não palavras, equivalentes umas às outras em tamanho e significado, de modo a poder estudar a associação entre idéias, cada sílaba, talvez, equivalendo a uma idéia (Cofer, 1969). A análise da sua obra e sua importância na História da Psicologia são aspectos tratados por diversos autores, dentre os quais destacam-se Boring (1957) e Postman (1968), e as inumráveis aplicações desse material forman sintetizadas magistralmente por Hilgard (1966) e, no Brasil, por Angelini (1953-1954).

Segundo Postman (1968) por diversas razões as sílabas sem sentido deixaram de apresentar as vantagens desejadas por Ebbinghaus. Embora estivesse enganado quanto às razões para a escolha do seu material, o seu erro foi produtivo porque as sílabas tornaram-se um recurso extremadamente útil no desenvolvimento dos estudos sobre a aprendizagem verbal, precisamente por não possuirem as propriedades que Ebbinghaus lhes atribuía. A heterogeneidade das sílabas em relação ao grau de conteúdo associativo e as diferenças correlatas na rapidez de aprendizagem chamaram a atenção, desde cedo, para os poderosos afeitos dos hábitos de linguagem na aquisição de novos materiais verbais. Durante muito tempo a influência dos hábitos de linguagem foi tratada mais como uma fonte de erro a ser controlada do que como foco de análise experimental.

Aliás, a próprio Ebbinghaus antecipou-se a esa crítica quanto observou que "As séries de sílabas exibem variações muito importantes e quase incompreensiveis em relação à facilidade ou dificuldade com que são aprendidas. Aparentemente as diferenças entre materiais com e sem sentido não são tão grandes como se é levado a imaginar a priori. Descobri, ao decorar algumas estrofes do "Don Juan" de Byron, uma distribuição das medidas numéricas não muito diferentes das obtidas com séries de sílabas sem sentido, com um tempo de aprendizagem aproximadamente igual. No último caso, as inumeráveis influências perturbadoras referidas acima parecem ter compensado umas às outras, produzindo um certo efeito intermediário, enquanto que no primeiro caso a prendisposição, devida à influencia da língua mãe, para certas combinações de letras e sílabas é muito heterogenea" (1885, p. 20).

Postman (1968) assinala que nos últimos anos tem-se dado maior ênfase à exploração sistematica do papel que os hábitos de linguagem pré-existentes possuem na aquisição e retenção de material verbal. As sílabas sem sentido e unidades semelhantes, representando graus de aproximação variados às dependências sequenciais da linguagem demonstraram ser um instrumento eficiente para eliciar e aferir as predisposições que o Sujeito traz ao laboratório. A pesquisa com as sílabas produziu importantes informações sistemáticas não apenas sobre os processos de integração de respostas mas também sobre o papel da semelhanca formal entre itens e as condições de

seleçao de estimulos. Assim, as sílabas sem sentido vieram a ser colocadas em uso analítico total muitos anos após sua invenção, enquanto provavelmente constituíam material inadequado para as primeiras pesquisas em que foram utilizadas, dirigidas á análise dos processos associativos.

Irion (1959) aponta a absoluta necessidade de padronização de materiais e procedimentos experimentais para o desenvolvimento da aprendizagem verbal. Considera também como obstáculo a esse desenvolvimento a inexistência de teorias capazes de sistematizar o volume gigantesco de dados até aqui obtidos, abrindo exceção apenas para a teoria de Hull et. al. (1940). Essa teoria, por sua natureza, abordagem, e pela época em que surgiu, deixou de provocar o impacto devido no domínio da aprendizajem verbal.

Método

O processo que será exposto adiante, com vistas à homogeneização formal de listas de unidades verbais, impõe um exame dos procedimentos adotados por Ebbinghaus. "Das consoantes simples do alfabeto, onze vogais e ditongos, todas as sílabas de um certo tipo foram construídas, com um som de vogal entre duas consoantes" (1885, p. 19). Acreditemos que Ebbinghaus tenha proposto essa estrutura em virtude da língua alemã possuir, em geral, sílabas fechadas, da forma CVC, segundo a contagem realizada em vários idiomas por Newman (1951).

A análise dos procedimentos adotados por Ebbinghaus destaca dois pontos importantes:

1. Sua preocupação com a simplicidade, e ao mesmo tempo, com a quantidade de material por obter, necessária à realização das medidas a que se propunha. Era necessário enriquecer o material, como grifamos acima, aumentando-o. Recorde-se a sua tentativa de utilização de algarismos, abandonada em virtude do pequeno número de combinaçãoes possíveis.

2. As regras adotadas inicialmente com o objetivo de evitar a contiguidade de sons semelhantes, foram depois abandonadas ao acaso, em virtude da impossibilidade, no método empregado, da imposição de restrições homogeneizadoras ao material produzido. No entanto, Ebbinghaus tinha conhecimento dessa deficiência, e a partir de Müller e Schumann (1894) inicia-se a longa série de críticas a respeito do problema da semelhança e contiguidade de ítens nas séries elaboradas por Ebbinghaus. Esses serão os aspectos tratados pelos procedimentos que serão expostos a seguir.

O número total de sílabas da forma CVC possíveis e pronunciáveis, em portugués, é dado por:

$$N = AR_{18}^{2} \times C_{5}^{1} = 1620$$

A ordem das sílabas nas séries será aleatória, pela utilização de uma subrotina que associará, a cada combinação gerada inicialmente em ordem alfabética, um número aleatório, colocando-as na ordem dos números aleatórios.

As seguintes restrições serão executadas automaticamente: (1) Uma sílaba não se iniciará pela consoante final da sílaba anterior. (2) A vogal central nao será repetida em sílabas consecutivas. (3) Serão eliminadas as sílabas com som igual ao de uma sílaba gerada anteriormente. Pela análise fonética da língua portuguesa, são as que possuem:

Q e C no início, antes de A, O ou U, ou no fim;
C e S no início, antes de E e I;
S e Z no fim;

G e J no início, antes de E e I;
M e N no fim.

Para satisfazer a necessidade de material, produzindo-o em combinações múltiplas, a série de números aleatórios será iniciada pelos algarismos correspondentes à hora de processamento do programa. Essa hora, em minutos, segundos e centésimos de segundo, sendo diferente a cada utilização do programa, produzirá sempre uma lista diversa da anterior, embora obedecendo ás mesmas restrições.

As listas obtidas por esse procedimento poderão constituir o ponto de partida para a calibração das sílabas em relação ao valor associativo ou de sighnificancia. Como evidencia a pesquisa de Archer (1960) é necessário, de tempos em tempos, reaferir as listas de sílabas sem sentido, em virtude da rápida alteração dos valores associativos ou de significância determinada pela dinamica de lingua. Nomes, siglas e palavras passam de um valor extremo para outro no espaço de alguns anos (por exemplo LIZ, IBM, etc.).

A mesma programação aprensentada no presente estudo é também aplicável a sílabas já calibradas, bastando substituir a geração inicial de todas as combinações possíveis pelas sílabas de valor pré-determinado para o experimento. A parte restante do programa executaria, então, as restrições de caráter formal.

As regras programadas foram baseadas em problemas encontrados usualmente na literatura sobre a aprendizagem verbal, e procurou-se demonstrar a viabilidade da execução automática de restrições típicas em experimentos com esse material. No entanto, quaisquer regras de carácter formal podem ser programadas do mesmo modo. Sabe-se, por exemplo, que a similaridade entre as sílabas tem efeito na memorização, variando segundo o número de letras que elas possuam em comun. Na aprendizagem de pares associados, as respostas corretas são dadas, nas primeiras tentativas, aos trigramas mais similares. Após as 15 primeiras tentativas o efeito se inverte (Underwood et. al., 1959). Esse problema, de natureza formal, é passível de idêntico tratamento.

Cumpre notar que às sílabas eliminadas em virtude das restrições poderiam ser associados outros números aleatórios, sendo então reaproveitadas pela inserção no final das listas. Com esee procedimento, cada lista seria accrescida de aproximadamente 200 unidades adicionais.

É óbvia, também, a possibilidade da exclusão de certas combinações, como por exemplo de todas as palavras de três letras com uma vogal central existentes no vocabulário da língua. Esse tipo de problema não foi aqui tratado. Pretende-se que o programa, de fácil implantação em qualquer computador, sirva de base para soluções, inclusive, em outros idiomas. Daí a ênfase no método empregado.

Discussão

Existe uma tendência a interpretar as técnicas utilizadas pela aprendizagem verbal em termos de teorias S-R, embora elas não se enquadrem necessariamente numa posição teórica limitada, pois podem proporcionar soluções em domínios diversos em função da posição teórica do Experimentador. Asch (1960), por exemplo, sugere a apresentação de sílabas segundo configurações geométricas. Kjeldergaard (1968), demonstra não estar o estímulo diretamente ligado à resposta. O estímulo e a resposta podem estar ligados por um ou mais mediadores, ou por uma corrente de mediadores, que inclui alguns ítens associados previamente apenas com o estímulo e alguns associados apenas com a resposta.

Em oposição e interpretações esquemáticas simplistas, é necessário considerar que as associações devem ser contextualmente dependentes (Lashley, 1950). Uma lista de pares associados é reaprendida mais rapidamente numa sala diferente de outra onde uma lista contraditória acabou de ser aprendida (Grenspoon & Ranyard, 1957).

Uma crítica mais fundamental aos modelos associacionistas da aprendizagem verbal deriva da análise da sintaxe como um sistema de regras dotado de uma estrutura hierárquica para gerar sentenças (Chomsky, 1957). As relações entre as palavras de uma sentença não podem, nesta abordagem, ser tratadas em termos de associações. Nem mesmo a capacidade de produção ou compreensão de novas sentanças pode ser conciliada com a premissa de que as mesmas são geradas partindo das dependências sequenciais entre as palavras.

Entretando, mesmo nesse enfoque o material aqui discutido tem encontrado aplicação. Os métodos utilizados para a obtenção dos valores *a* e *m*, pertinentes à aprendizagem verbal, são também considerados singnificativos para os estudos longuísticos (Greenberg & Jenkins, 1964). Demonstrou-se que uma amior organização gramatical, a forma da sentença contendo um artigo e uma preposição intercalados numa série de trigramas torna a aprendizagem mais fácil do que numa organização randômica ou com terminais gramaticais deslocados (Epstein, 1961, 1962). A ênfase da capacidade de utilização de regras, e a inadequação dos processos associativos para a explicação dessa mesma capacidade serão objeto de investigação analitica em futuro próximo (Cofer, 1969).

Além dos enfoques teóricos acima referidos, é importante mencionar a aplicação recente de um tratamento relacionado à psicofísica contemporânea, a Teoria da Deteção do Sinal, ao estudo da memória de reconhecimento (Parks, 1966; Murdock, 1962, 1965, 1966). Essa teoria foi aprensentada em "Signal Detection Theory and Psychophysics" (Green & Swets, 1966). O Sujeito é exposto a um problema de desisão semelhante a uma tarefa de deteção psicofísica (Bernbach, 1967). O ruído é substituído por trigramas desconhecidos e o sinal por trigramas anteriormente apresentados ao Sujeito. Como a teoria define a curva de operação do receptor e o critério ótimo, ou de ganho máximo, permite levar em conta os fatores motivacionais do Sujeito e o seu critério de resposta. O uso da sílaba sem sentido nesse contexto, representa uma retomada da abordagem inicial de Ebbinghaus.

A sugestão do presente trabalho é referente ao setor da aprendizagem verbal compreendido pela "Rote-Learning". Foram mencionadas as áreas periféricas de modo a ilustrar os possíveis campos de aplicação de material resultante de técnicas computacionais.

O programa aqui discutido, e as listas produzidas pelo mesmo, podem ser solicitados ao Departamento de Psicologia, Pontifícia Universidade Católica do Rio de Janeiro, Rio de Janeiro, R. J., Brasil.

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A COMPARISON OF VOCATIONAL INTERESTS OF MEXICAN AMERICANS IN TEXAS AND MEXICANS IN TWO REGIONS OF MEXICO

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This paper reports the results of the applications of the Geist Picture Interest Inventory in its two Spanish editions and its US edition to 328 México-Americans, 641 Mexicans and 54 Anglo-Americans. Comparisons are made of the different interest patterns.

Este trabajo presenta los resultados de la aplicación del Inventario de Intereses Ilustrados de Geist a una muestra de 328 Mexico-Americanos, 641 Mexicanos y 54 Anglo-Americanos. El trabajo presenta comparaciones entre los diferentes perfiles de intereses.

The Spanish version of the Geist Picture Interest Inventory (GPII) comes in two editions. One edition is designed for Puerto Rico and Spanish speaking people in the United States and the other designed for use in Mexico, Central America and Spanish speaking South America. The pictures in each are in the same *areas* of interest, but the pictures are altered to exemplify the culture of that particular geographical area.[2] The problem here is to compare the vocational interests of Mexican Americans in Texas with the vocational interests of Mexicans in two regions of Mexico.

Method

The U.S. Spanish, Puerto Rican edition was given to 328 Mexican Americans (204 males and 124 females) in Harlingen, Texas on the Texas-Mexican border. These Mexican Americans had an age range of 20-65 and were all from the lower socio-economic group.

The Latin, Spanish edition was given to 425 male students in Mexico, D.F. (in what corresponds to U.S. 6th grade) and 216 male students in Chihuahua, Chih., Mexico, in the primer año secundaria, segundo año secundaria, and tercer año secundaria.

In order to do cross cultural comparisons, the mean raw score for each scale[3] was computed for each sample in each country. This was divided by the total possible

[1] The author is indebted to: Mr. Tom Aycock, Psychological Associate, Harlingen Vocational Evaluation Center, Harlingen, Texas, for gathering data on Mexican Americans and Anglo Texans in Texas: Señora Blanca de Alvarez, Executive Director Instituto Interamericano de Estudios Psicologicos y Sociales, S.C., Chihuahua, Chih., Mexico, for gathering data in Chihuahua, Mexico, and: Doctor Rafael Nuñez, Professor of Psychology, Interamerican University, Puebla, Pue. Mexico, for gathering data in Mexico, D.F.

[2] For example in the U.S. Spanish and Puerto Rican edition, there is a picture of a baseball player. In the Spanish, Latin American edition, this picture was replaced with a soccer (futbol) player.

[3] The scales are persuasive, clerical, mechanical, scientific, musical, outdoor, literary, computational, artistic, social service, and dramatic. The female edition has the same scales with the addition of a personal service area.

number of items in each scale chosen by each sample and converted to a percentage. The three highest and three lowest areas of interest for each sample was computed. Results are given in Table 1.

Table 1
MEXICAN AMERICANS IN TEXAS

Male N = 204

Highest[4]	Lowest[5]
1. Clerical	1. Dramatic
2. Persuasive	2. Scientific
3. Mechanical	3. Literary

Female N = 124

Highest	Lowest
1. Scientific	1. Dramatic
2. Persuasive	2. Musical
3. Artistic	3. Outdoor

Mexicans in Mexico

Mexico D.F.

Male N = 425

Highest	Lowest
1. Scientific	1. Musical
2. Computational	2. Dramatic
3. Literary	3. Mechanical

Chihuahua

Male N = 34
(Primer año Secundaria)

Highest	Lowest
1. Scientific	1. Musical
2. Computational	2. Dramatic
3. Literary	3. Outdoor

Male N = 80
(Segundo año Secundaria)

1. Artistic	1. Musical
2. Scientific	2. Dramatic
3. Computational	3. Persuasive

Male N = 102
(Tercer año Secundaria)

1. Computational	1. Musical
2. Scientific	2. Dramatic
3. Literary	3. Mechanical

[4] In descending order; the highest area is first.

[5] In ascending order; the lowest area is first.

Discussion

First, it might be of interest to compare the two regions within Mexico. In every case except the Segundo año Secundaria in Chihuahua, the patterns of "highest interest" were scientific, computational and literary (in this grade in Chihuahua, literary was replaced by artistic) suggesting that these students in these two geographic areas in Mexico chose areas of interest which represent the professions, particularly those in the engineering, medical, chemical, physical and other scientific endeavors, and literary occupations have more appeal and interest to these students than those occupations representing the arts such as musicians or bands or orchestras or the dramatic arts. We observed that 63% of the Mexicans in Mexico City chose the scientific areas while only 16% chose the dramatic area. This agrees quite closely with the total Mexican group in Chihuahua where 16% chose the dramatic area. The situation is quite different for the Mexican Americans in Texas. Here the highest interests were in the low level clerical and semi-skilled mechanical occupations while the "least" interests were in the areas which were highest in Mexico. The percentage level for scientific interests for male Mexican Americans in Texas is 38% while clerical is 53%. It is rather interesting that the interest pattern of the female Mexican Americans is more like that of the male Mexican students than the male Mexican Americans. For example, female Mexican Americans have a "computational" percentage of 60.4 (Chihuahua) and 59% (Mexico City). For lowest interests the female Mexican Americans had a percentage of 1% in the dramatic scale while the male Mexicans had a 16% choices for this scale. It appears that age, socio-economic status, being in the U.S.A. and in a disadvantaged group, has a definite influence on the occupational choice interest patterns of male Mexican Americans as compared to male Mexicans in Mexico who do not feel discrimination in their own country.

In addition to the comparisons made above, the interest patterns of the Mexican-Americans in Texas were compared with the interest patterns of non-Mexican-Americans in the same geographical area. The American edition of the Inventory (with the same pictures as the bilingual U.S. Spanish, Puerto Rican edition) was given to 54 non-Mexican-Americans (31 male and 23 female) in Harlingen. The non-Mexican-Americans who might be termed "Anglo-Texans" were in the same socio-economic status and approximate age range as the Mexican-Americans. Results are given in Table 2.

Table 2
RESULTS

Anglo-Texans in Texas			
Male N = 31		Female N = 23	
Highest	Lowest	Highest	Lowest
1. Persuasive	1. Dramatic	1. Scientific	1. Dramatic
2. Clerical	2. Musical	2. Artistic Personal Service (Tied)	2. Musical
3. Computational	3. Artistic	3. Persuasive	3. Computational

In comparing the Mexican-American with the male Anglo-American (Texan) interest patterns we note that both sets of interests are quite similar in both groups. Persuasive is high in both groups (49% and 50% for Mexican-Americans and Anglo-American males respectively). This might suggest that Mexican American males would like to have further training in clerical work to replace their traditional current jobs as farm hands. Comparing the female Mexican-Americans with female Anglo-Texans in Texas, we see that persuasive is still high in both groups, and that personal service is high in the female Anglo-Texans but not the female Mexican-Americans. The female Mexican-Americans seem to have interests in the professional and artistic occupations while the female Anglo-Texans have interests in the personal service and unskilled trades. Finally, it will be noted that both male and female anglo-Texans have "low" interest patterns which are almost the same, suggesting that similarity of interest patterns may be more a function of race, rather than sex or living in the same geographical region.

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WEAVING, COLOR TERMS, AND PATTERN REPRESENTATION: CULTURAL INFLUENCES AND COGNITIVE DEVELOPMENT AMONG THE ZINACANTECOS OF SOUTHERN MEXICO[1]

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Our study examined the question of how specific cultural experiences foster the development of particular cognitive skills by examining the relation between weaving, an important craft among the Zinacantecos, and pattern representation. We found that knowing how a pattern is woven influenced the weaver's concept of that pattern, but weaving experience did not promote a generalized facility in representing patterns. School experience alone had an effect similar to weaving on representation of the woven patterns. Use of color in patterns was related to an individual's color lexicon. There was also evidence for universal processes in the development of pattern representation.

Este estudio examinó la relación entre ciertas experiencias culturales y el desarrollo de ciertas habilidades cognoscitivas a través del estudio de la relación entre la actividad de tejer (actividad artesanal muy importante entre los Zinacantecos) y la representación de patrones. Se encontró que el hecho de saber cómo se teje un patrón influía en el concepto que el tejedor tenía de tal patrón, pero la experiencia de tejer no promovía una facilidad generalizada de representar patrones. La experiencia escolar en sí tenía un efecto similar a la actividad de tejer en cuanto a la representación de los patrones de tejido. El uso de los colores en los patrones estuvo relacionado al léxico de colores del individuo. Hubo también evidencia sobre procesos universales en el desarrollo de la representación de patrones.

Does knowing how to weave a given pattern have an effect on the weaver's mental representation or concept of that pattern? Can a specific skill like weaving promote a general ability to represent abstract linear patterns? Our study sought answers to these questions in the hopes of shedding light on the problem of how culture-specific experiences foster the development of particular cognitive skills. Looking at this matter from the point of view of weaving itself, we hoped that the study would also provide information about the cognitive nature of learning a manual skill.

[1] Carla Childs received financial support from the National Science Foundation and the Mexican government, through an Abraham Lincoln Fellowship. Data from the first summer, 1969, was the basis of her honors thesis in anthropology, entitled "Developmental Study of Pattern Representation in Zinacantan".

[2] We are indebted to Evon Z. Vogt, Director of the Harvard Chiapas Project, for making it possible for us to work together in Zinacantan as members of the Project for three (C. C.) and two (P. M. G.) summers. We greatly benefited from the stimulation, experience, and friendship of its staff and students. We owe a special debt of gratitude to T. Berry Brazelton, M. D., Fellow at the Center for Cognitive Studies, and John S. Robey, M. D., who initiated developmental study among the Zinacantecos and who invited one of us (P. M. G.) to participate in this exciting venture.
For making our research in Navencavuk the most pleasurable aspect of the entire project, we thank Xun and Xunka Pavlu, the Pavlu children and grandchildren, and the members of all the families in Navencavuk who participated in the experiments. This paper incorporates many valuable suggestions from George Collier, Michael Cole, Sarah Harkness, Nancy Modiano, and Douglas Price-Williams, all of whom generously commented on an earlier draft.

[3] Reprints can be ordered from the senior author at the Department of Psychology, UCLA, Los Angeles, California 90024.

Our research was inspired by Price-Williams, Gordon, and Ramirez' (1967) study in Mexico which demonstrated both a specific influence of pottery-making on the concept of quantity of clay substance and a general influence on other quantitative concepts, all described by Piaget under the rubric of "conservation".

The research was conducted in Chiapas, Mexico, with Zinacanteco Indian children of different ages, both sexes, different degrees of schooling, and different amounts of weaving skill. Comparison among the various subgroups allowed us to place pattern representation in a developmental context and to relate this ability to the general demands of Zinacanteco culture, as well as to the specific demands of Zinacanteco weaving. In the course of investigating these matters, our experimental method yielded interesting findings on color choice in pattern continuation tasks, and raised a question as to whether a person's use of color in patterns is related to his or her color lexicon.

Zinacantan: Background for the Experiment

Ethnographic Information

In explaining the performances of the Zinacantecos on our tasks, we must first explain some of the things that make Zinacantecos different from Americans and different from each other.[4] The Zinacantecos are a Mayan people dwelling in the highlands of Chiapas, Mexico, near the Guatemalan border. They are ethnically distinct, putting pride in traditional behavior.

The *municipio* of Zinacantan has a population of approximately 8,000, and about one-fifth of these people live in the major hamlet of Nabencavuk, site of our experiments. Within Nabencavuk, houses are grouped in clusters reflecting patrilocally extended domestic groups (Vogt, 1969) and are interspersed with cornfields and flower plots. Beans and tortillas constitute the staple diet.

Zinacantan is a male-oriented society. Men hold most of the important religious and political roles; women are influential in these spheres only through their husbands or in their old age. To be influential, a man must be *p'ih*[5] or clever. Advancement along any of the available lines of power involves detailed organization of one's life, especially in its economic aspects (Cancian, 1965). After deciding upon his goals, a man must arrange his life so as to achieve them as nearly as possible. The skills and intelligence required for life as a successful Zinacanteco are not incomparable to the analytical problem-solving ability that is cultivated in Western school systems.

Schooling in Nabencavuk

Nabencavuk, the Zinacantecan hamlet in which we worked, has two schools a state school built about forty years ago, and a new federal school, built in 1966. The second school is said to be the result of a request to the authorities made by the leaders of the community. The large population of the hamlet (the 1960 census figure is 1,427) and the poor quality of the teaching in the older school prompted their action. The effectiveness of teaching in all Indian schools in Chiapas is questionable. Teachers are often sent there because they did not perform well elsewhere. Few know anything of the oral Indian languages, and their Spanish teaching methods are based on rote performance. Not all children go to school; but in recent years both interest and attendance have been increasing, and now girls are beginning to attend.

[4] For a more complete and detailed account of Zinacanteco culture, the reader should consult *Zinacantan* by E. Z. Vogt (1969).

[5] Tzotzil words are written throughout in the orthography used in the Tzotzil-English, English-Tzotzil Field Dictionary adapted from Laughlin's Tzotzil-English Dictionary. For reading purposes, *x* is pronounced as "sh" in English, *c* as "ch" and *z* as "ts"

Weaving in Zinacantan

One of the reasons for not sending girls to school is that they should stay home and learn to cook and weave. Weaving, the skill with which our experiment is concerned, is of great importance in Zinacantan. Women weave almost all clothing on backstrap looms. The two most visible, and, by Zinacanteco standards, most beautiful garments are the *pok' k'u ul*, a cotton poncho worn by all men, and the *pok' mocebal*, a cotton shawl worn by all women. Boys and girls wear smaller versions of the same red and white striped garments. Though some variation is allowed, certain distinctive elements of the two patterns must remain fixed. The defining features of the two patterns can be seen in Figure 1, where two possible versions of a *pok' k'u ul* and two possible versions of a *pok' mocebal* are shown.

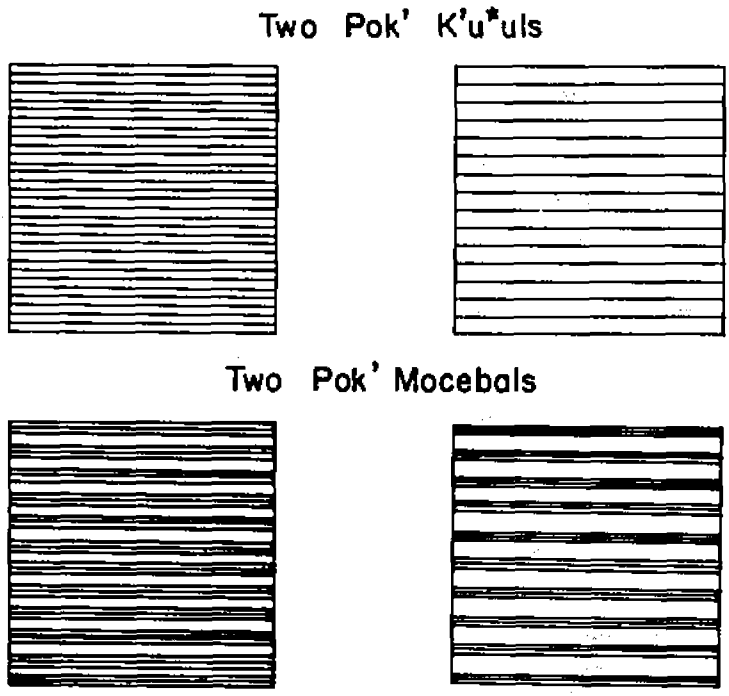

Figure 1 Zinacanteco woven patterns

The representation of these patterns constituted the focus of our study, and in fact, are the only patterns ever woven in cotton. There is only one other pattern woven by Zinacanteco women, a somewhat more complicated black and white pattern done in wool or wool and cotton.

The weaving process itself is a long complicated one. The first two steps—spinning and dyeing— are not necessary for all garments. The next step —winding the warp threads onto a frame— gives the threads their first shed and gives the final piece of cloth

whatever striped pattern it may have. Thus, the striped patterns are differentiated at the warp-winding stage. Girls start learning to weave when they are about nine-or ten-years-old. Before eight, they are simply not strong enough to operate a loom. They learn the easier steps of weaving first — boiling warp threads and dyeing wool. Weaving itself comes next, then warp-winding, and finally spinning. By age twelve or thirteen a girl can weave on her own without adult supervision. Not all Zinacanteco women become highly skilled at these tasks, but all attain some degree of proficiency.

Method

Tasks and Procedure

We did not take a U.S. test and present it to the Zinacantecos, but rather developed our procedures from what we knew of Zinacanteco culture. In principle we followed the strategy suggested by Price-Williams (1967), of starting with a familiar task, performed with familiar materials in a familiar context, next varying the context, then, in addition, the materials, and, finally, the task itself. This strategy makes it theoretically possible to judge the extent to which a person is capable of generalizing the skills involved in a specific task beyond the context in which they were originally learned.

The task itself consisted mainly of placing wooden sticks of different colors and widths into a wooden frame to make different striped patterns. Our equipment consisted of a wooden frame with inside dimensions of 9 by 16 inches and a total of 218 colored sticks. All were 9 inches long and three-quarters of an inch high. In width they measured one-quarter inch, one and one-quarter inches, and two and one-quarter inches. The reason for having sticks of varying widths was to permit varying degrees of detail and abstractness in the representation of woven patterns. In weaving, one can create a broad stripe with a number of threads of the same color, analagous in our experiment to using several narrow sticks of the same color. In our experiment, it was also possible to create a broad stripe with a broad stick, a representational device that is a more abstract, if less detailed representation of woven stripes. The availability of sticks of three different widths corresponding to stripes of three different widths in the *pok' ku*ul* and *pok' mucbal* made it possible to investigate the effects of weaving and other kinds of experience on the representational conventions used to reproduce the two woven patterns. There were eight different colors — red, white, orange, light pink, olive green, yellow, black, and sky blue. The 60 white, 60 red, 30 pink, and 30 orange sticks came in all three widths. The remaining sticks — 16 green, 16 yellow, 3 black, and 3 blue, came only in the narrowest width. These color descriptions refer to colors designated by the English terms. The relation of the stick colors to Tzotzil color terminology will be discussed later. The frame served to eliminate the culture-sensitive skill of orienting designs in space; there was only one way to place the sticks (Deregowski, 1968).

We presented the subjects with the frame and the sticks and demonstrated how to put them in. Participants were then given a series of nine pattern representation tasks. An overview of the tasks in terms of the dimensions of familiarity and complexity is presented in Table 1.

The first two problems of the experiment (unfamiliar context) involved using strange materials in a *familiar task*. We asked the subjects to use our colored sticks to make representations of two items of their own clothing-the *pok' k'u*ul* (top of figure 1) and the *pok' mucbal* (bottom of Figure 1). By starting with a representation of the subjects' own clothing we hoped to keep the task from being ethnocentric or centri-cultural (Wober, 1969). These two problems constituted our greatest degree of cultural familiarity. The

Table 1
CHARACTERISTICS OF THE PATTERNS

Familiar tasks with unfamiliar materials: Pattern representations		Unfamiliar tasks with unfamiliar materials: Pattern continuations		
		More familiar ←Color→ Less familiar		
Less complex ↑ Pattern ↓ More complex	Pattern 1 (*pok' ku•ul*)	Pattern 3	Pattern 6	Less complex (more familiar) ↑ Pattern ↓ More complex (Less familiar)
		Pattern 4	Pattern 7	
	Pattern 2 (*pok' mocebal*)	Pattern 5	Pattern 8	

two highest degrees of cultural familiarity schematized by Price-Williams were impossible to integrate into this study. Zinacantecos would have been outraged had we used the real materials of weaving in an artificial experimental context — the conditions required by the second level of familiarity. To study pattern representation in its most familiar manifestation would require observing the weaving process itself. Because variation was neither permitted nor observed in Zinacanteco patterns, the weaving process really offered nothing to study in the domain of pattern representation. The process of learning to weave did, however, become the topic of a later study, yet to be reported. Despite the absence of an opportunity to observe Zinacanteco pattern representation in its most familiar contexts, our design did utilize Price-Williams' strategy in that the remaining seven problems constituted a stepwise progression in the direction of unfamiliarity. While the two woven patterns were equally familiar, they were not equally complex. The relative complexity of the two patterns can be seen in Figure 1. We asked for the simpler pattern — the *pok' k'u •ul* — first. Since Zinacanteco children dress exactly like adult Zinacantecos, each subject was wearing one of these garments. The other garment was also present in the experimental situation, either in the *pok' k'u•ul* of our informant or his son or in the *pok' mocebal* that the experimenter wore. The various widths of red, white, pink and orange sticks were available for those first two tasks. The different kinds of stick gave the children the opportunity of using several strategies for representing the difference between the two patterns.

We next shifted to an *unfamiliar task* — pattern continuation. We started a pattern, with three repetitions of its repeating unit, and asked the child to finish it, doing it the same way. Our six continuations went from more to less familiar along two dimensions-pattern and color. We started a simple red and white alternation similar to the configuration of the *pok' k'u•ul* in the first task (Figure 2[6], Pattern 3), and asked the child to continue it.[7]

[6] The Figures are not made to scale in relation to the wooden frame. Only the relationship between the widths of the sticks is accurate.

[7] Only the narrowest red and white sticks were used, but the larger red and white sticks and orange and pink sticks of all sizes were available for the children, as in the first two tasks.

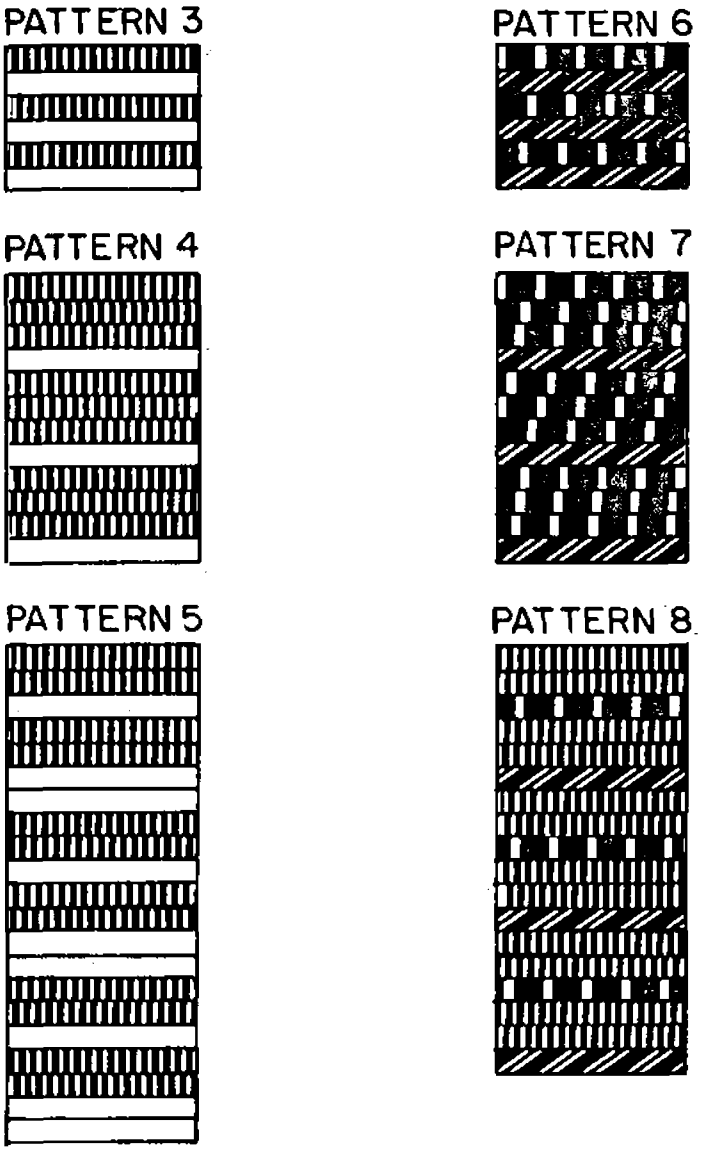

Figure 2. Models for pattern continuation

We then switched to color combinations (green + yellow; green + yellow + red) that did not appear in Zinacanteco clothing patterns (although Zinacantecos did have red and green belts and all three colors could appear in nonpatterned borders). The next three models (Figure 2) followed each other in degree of familiarity and complexity in a sequence parallel to that of the first three. The parallel structure of Patterns 5 and 8 needs explanation, as it is on a more abstract level that the others. If each kind of stripe is considered a pattern element and assigned a letter (A, B, C), then Pattern 5 and 8 are parallel in that they both consist of the sequence ABAC. They differ in so far as the third

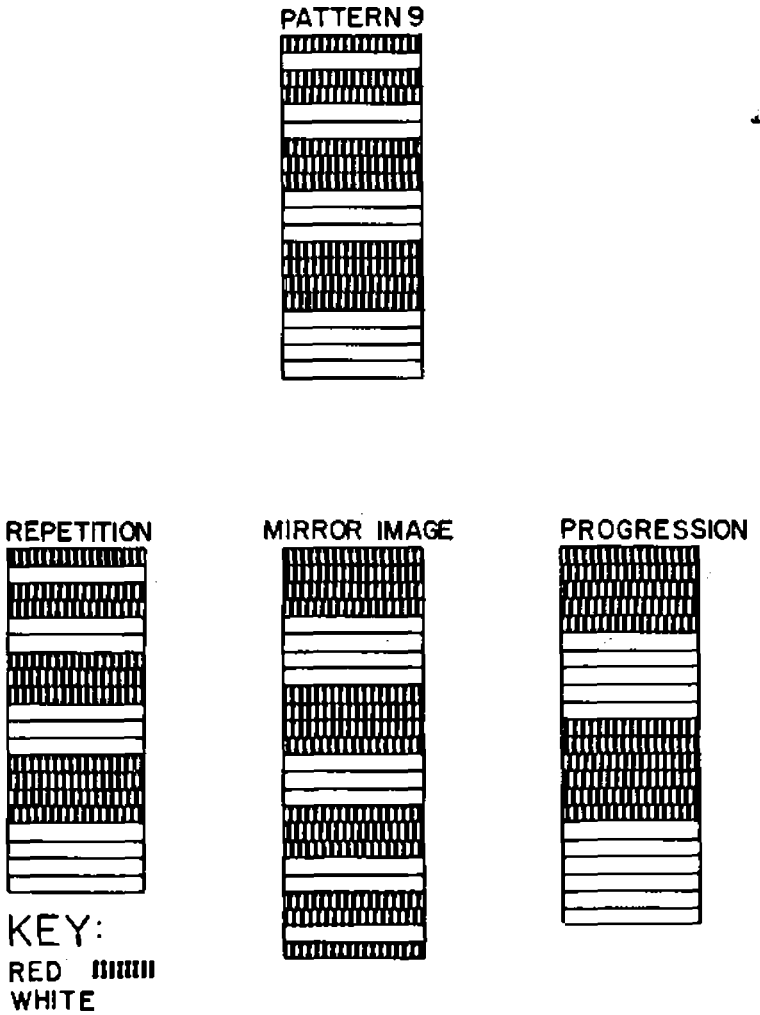

Figure 3. Model for growing pattern and three possible continuations

element, C, is created in Pattern 5 by adding a second stick of the same color to B, in Pattern 8 by making a one-stick stripe of a third color.

The sticks available to complete patterns 6 and 7 were the thin green, yellow; black, and blue ones. The models used only green and yellow (Figure 2). The available sticks for Pattern 8 were limited to the correct ones: thin red, green, and yellow ones.

At this point in the experiment we put in a growing pattern to give the subjects a chance to stop merely imitating our behavior and do some expanding of the original pattern (Figure 3). Three correct continuations of the pattern are possible.

The tenth task involved a shift of the materials from wood to paper. The subject saw a model pattern drawn on paper and had to match it by choosing one of three alternative patterns. We thought we were keeping the task the same —pattern continuation— but in fact, we introduced the confusing element of multiple-choice. The concept of multiple-choice never really made the transition to Zinacantecan. One problem was the difficulty of doing a clear demonstration of a multiple-choice task. These tasks elicited mass confusion: children often placed their choice on top of the original, turned their choice around, piled all four papers on top of each other, or paired their choice with the original and then paired the two remaining patterns. Data from the multiple-choice problems were therefore not analyzed; but the difficulty posed by the problem mode *per se* is both an interesting finding about cognition and a methodological lesson for cross-cultural research.

The specific instructions and procedure were developed through extensive work with our informant, Xun Pavlu, and through pretesting the procedures with Zinacanteco children.

Experimental Desing

The Zinacanteco participants in the study were constituted into groups along the dimensions of age, sex, and schooling, as shown in Table 2.

Table 2
ZINACANTECO SAMPLE CHARACTERISTICS

	Traditional Zinacanteco Education Only					
	Age 4-5		Age 8-10		Age 13-18	
	Female	Male	Female	Male	Female	Male
Extent of Participation						
Patterns 1-9	6	6	6	6	9	9
Patterns 1-3 only	0	0	3	2	9	4
	Federal or State School					
Patterns 1-9	0	0	0	10	0	9
Patterns 1-3 only	0	0	0	2	0	3

Zinacanteco girls are generally rather skilled weavers by the time they reach the age of our oldest participants, while Zinacanteco boys do not learn to weave. School girls were not included because none existed in the oldest age range and very few in the

middle age group. No school children existed in the youngest age group because these children were too young for school.

In comparing the development of pattern representation in schooled and unschooled groups of boys, it is important to consider what factors determine *which* boys are selected for schooling. If these factors relate to the cognitive abilities being tested in our experiment, then apparent effects of school experience may be artifacts of the original selection bias. Ignorance on the part of the parents was mentioned as a reason why a whole family of boys might not go to school. This source of bias, whether related to ignorance of modern ways or innate ability would tend to bias the school group foward greater ability than the unschooled group. On the other hand, boys without fathers living at home may tend to go to school (Trosper, 1967). This factor would not bias the sample either way. The most usual pattern, however, is for some but not all sons in a family to attend school. The only basis for within-family selection which emerged spontaneously either from our informant in Nabencavuk or from Trosper's (1967) group of informants in another Zinacanteco village relates to the family's need for help at home. The first-born son is least likely to receive a school education because he is needed at home. This selection factor would not cause sample bias in terms of cognitive ability. When asked directly whether parents ever send their smartest children to school, our informant in Nabencavuk claimed the opposite to be the case: parents send the stupid ones to school so the teacher can make them smart, while bringing up their smart children at home. Thus, the biasing factors go in both directions, one tending to produce a school group of greater ability, the other tending to produce a school group of lesser ability. In any case, the pattern of results, to be reported, eliminates the possibility that performance differences have been produced by ability differences between the schooled and unschooled groups that existed independently of the school experience. For these reasons, sample bias does not appear to be a problem in assessing the effects of schooling in the present study.

In summary, our experimental design made it possible to assess the effects of age, sex, and schooling on the children's approach to the pattern representation tasks. In terms of groups, it was not possible to separate sex from weaving skill as these are perfectly correlated in the Zinacanteco culture. Females always learn to weave; males never do. We were, therefore, dependent upon the pattern of results across tasks to detect distinct effects of these two independent variables in the group comparisons.

Supplementing the group division according to age, sex, and schooling, however, were questions which could reveal relevant differences in weaving experience even within the female groups.

Each girl was asked how much she knew about weaving in a detailed way. After determining the steps of the weaving process the girls had learned, Childs asked them specifically which garments they had woven and wound warps for, to see if their knowledge of the construction of the woven striped patterns represented in our experiment was first-hand.

Results and discussion

Representation of Woven Patterns

Effect of age and weaving skill. Table 3 shows how the children represented the *pok' k'u°ul* and *pok' mocebal*. Examples of the two garments are shown in detail in Figure 1. Of the youngest children, only one had reached a stage where he could represent both patterns as a simple alternation; none could differentiate the two. All seemed to

Table 3

PERCENTAGES OF CHILDREN IN DIFFERENT GROUPS REPRESENTING THE WOVEN PATTERNS (POK' K'U'UL AND POK' MOCEBAL) IN VARIOUS WAYS

	Unschooled groups				Schooled groups		
	4-5 yr old Girls & Boys (*N* = 12)	8-10 yr old Girls & Boys (*N* = 7)	13-18 yr old Girls (*N* = 18)	13-18 yr old Boys (*N* = 15)	10 yr old Boys (*N* = 12)	13-18 yr old Boys (*N* = 12)	18 yr old college Girls (*N* = 6)
Patterns Differentiated by *complete* analytic representations of threads	0	0	33%	15%	0	50%	0
Patterns differentiated by *abstract* analytic representation of threads	0	0	0	0	0	0	67%
Patterns differentiated by width of stripes, represented *in detail.*	0	6%	17%	39%	33%	8%	0
Patterns differentiated by width of stripes, represented *abstractly*	0	0	22%	0	0	0	33%
Patterns differentiated by color.	0	0	0	31%	17%	8%	0
Both Patterns the same or differentiated ambiguously	0	71%	28%	15%	28%	34%	0
Both patterns constructed randomly (no differentiation)	100%	23%	0	0	25%	0	0
	100%	100%	100%	100%	100%	100%	100%

preoccupied with the task of fitting the sticks into the frame to pay much attention to which sticks went in and in what order. The same preoccupation was in operation during their continuation of the pattern models. Random choice, dominant in the continuations, was predominant here.

Most of the unschooled eight-, nine-, and ten-year olds could represent the patterns

in one way or another. Nevertheless, only one child, one of the two girls in this group who knew how to weave, differentiated the patterns. The modal strategy, used by six children, was to represent both patterns as a regular alternation of red and white. Thus,

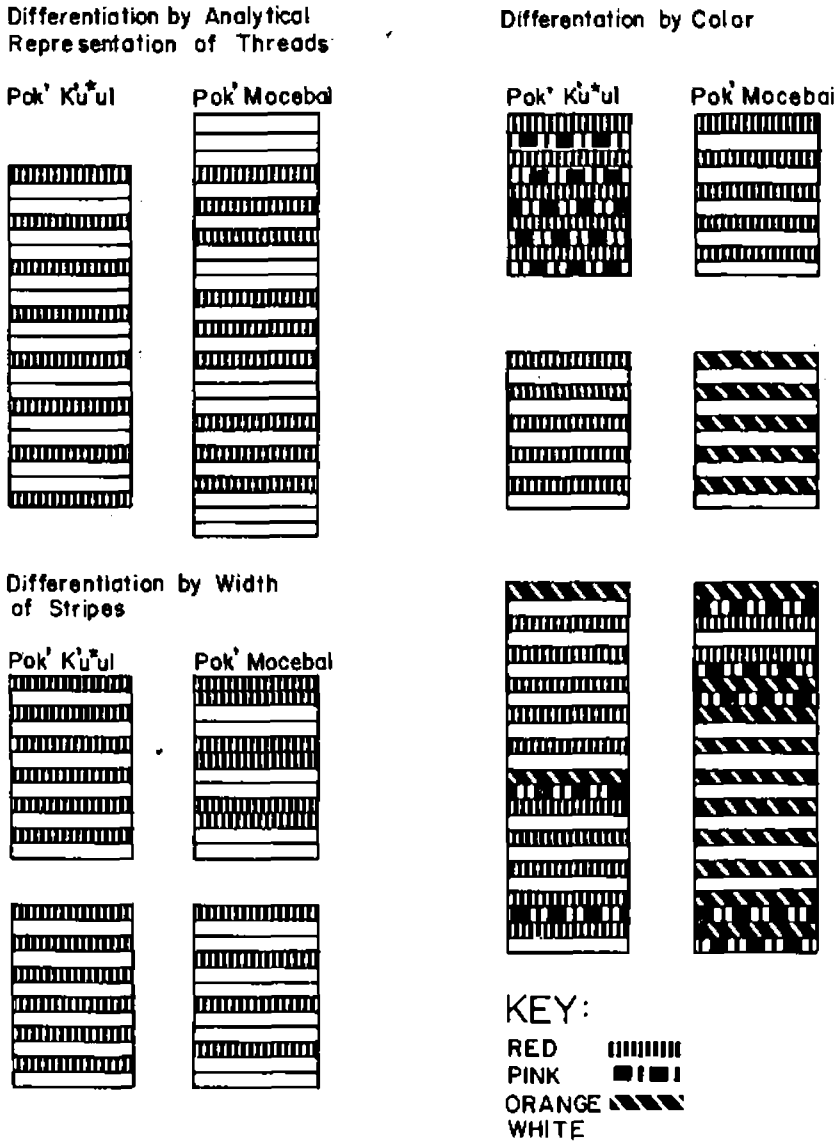

Figure 4. Zinacanteco ways of representing the woven patterns

the *pok' mocebal* pattern, containing three differentiated parts or elements, became identical with the two-part *pok' k'u*ul* pattern. It is clear that the general failure to differentiate the two patterns stems from a failure to differentiate the elements within the more complex pattern. The tendency of this age group to simplify the more complex patterns was also manifest in the pattern continuations, to be described later.

Among the oldest children there are several different ways of representing the patterns. More girls than boys showed detailed analysis of the threads (Figure 4): the crucial feature in this type of representation is maintaining the configuration of stripes in the two patterns, including the thin white stripes in the *pok' mocebal*. Although this type of representation was more than twice as frequent among girls than boys, specific weaving experience did not seem to make any difference.

Zinacanteco boys are clothes-conscious too, but their representations of the two woven patterns show that they consider a different aspect of the patterns significant. When the *pok' k'u*ul* and *pok' mocebal* is seen from a distance, its thin stripes tend to disappear and the pattern looks like a solid pink or light red color. Therefore the *pok' k'u*ul* gives the impression of being "more red" and the latter of being "less red," even though the threads in the two garments are exactly the same color. This aspect of general appearance was chosen by four out of 13 of the oldest boys as the essential difference between the patterns. Figure 4 gives examples of differentiation by color: the boys used pink and orange stricks to express the visual effect of greater and lesser "redness" One of the boys who chose color as the feature differentiation on the two woven patterns used pink sticks in the *pok' mocebal*, white in the *pok' k'u*ul*, seemingly reversing the concept of the *pok' k'u*ul* as the "redder". None of the girls used color to differentiate the two woven patterns. There was further evidence that the girls treated color as a less important feature in representing the *pok' k'u*ul* and *pok' mocebal* the overwhelming majority of the oldest group freely substituted pink for white and orange for red in their representations, whereas most of the oldest boys did not. This difference between the two groups is significant at the .02 level according to a x^2 test (two-tailed).

The girls' attention to the structural detail of the patterns contrasts with the boys' representation of a difference in superficial appearance, a diference nonetheless important in making the distinction between male and female Zinacanteco clothing. The role requirements of a Zinacanteco woman in relation to clothing are different. Girls need to know and use the detailed aspects of the patterns more than boys and so are more apt to choose those aspects when representing them.

A third feature, used equally by both girls and boys to differentiate the woven patterns, is width of stripes. But boys and girls had different ways of representing this differentiating feature. Examples of the method used more frequently by boys are shown in Figure 4. The *pok' mocebal* is represented as having broader white stripes and, sometimes, broader red stripes by the addition of more narrow stick. The distinct red and white parts composing the red stripe of the *pok' mocebal* are not preserved; the red stripe is constructed as an undifferentiated element When the girls use stripe width to differentiate the patterns, they usually use the wider blocks to represent wider stripes, in contrast to the boys. Thus, a wide red stick could be used to form an abstract representation of the three thin red stripes separated by a few white threads in the *pok' mocebal*. Not all the differentiations were related to the patterns in an obvious way, however. For instance, one girl used alternation of red and white to represent both patterns, but used wider red and wider white sticks for the *pok' k'u*ul*.

These sex differences in the representation of the woven patterns, significant at the .01 level (Fisher's Test, one-tailed), must relate specifically to weaving skill rather than to other aspects of Zinacanteco sex differentiation, for the pattern of sex differences is reversed in the novel pattern continuations, as we will see.

Effect of Schooling.

School experience seems to have had a strong influence on the representation of the woven patterns (Table 3). At the middle age level the schooled boys show a much greater ability than the unschooled boys to differentiate the two patterns; this difference is significant at the .05 level (Fisher Test, two-tailed).

By adolescence, the boys with school experience represent the woven patterns more like the female weavers than like the male nonweavers! Like the unschooled boys, the schooled boys did not know how to weave. Yet their frequency of thread-by-thread representations, is significantly higher ($p < .01$, two tailed Fisher Test).

An interest in the effect of formal education led to the inclusion of a group of six U.S. students at Radcliffe College. These female students, lacking all experience with the woven patterns, were shown a *pok' k'u*ul* and a *pok' mocebal* and asked to represent them using the same sticks and frame as the Zinacanteco subjects. This student sample had the highest proportion of all groups of analytic representations (Table 3); but they were of a different sort (Figure 5). While maintaining the configuration of stripes in the two patterns, they simplified their representation of the broader stripes, using a single broad stick instead of a group of narrow ones. The

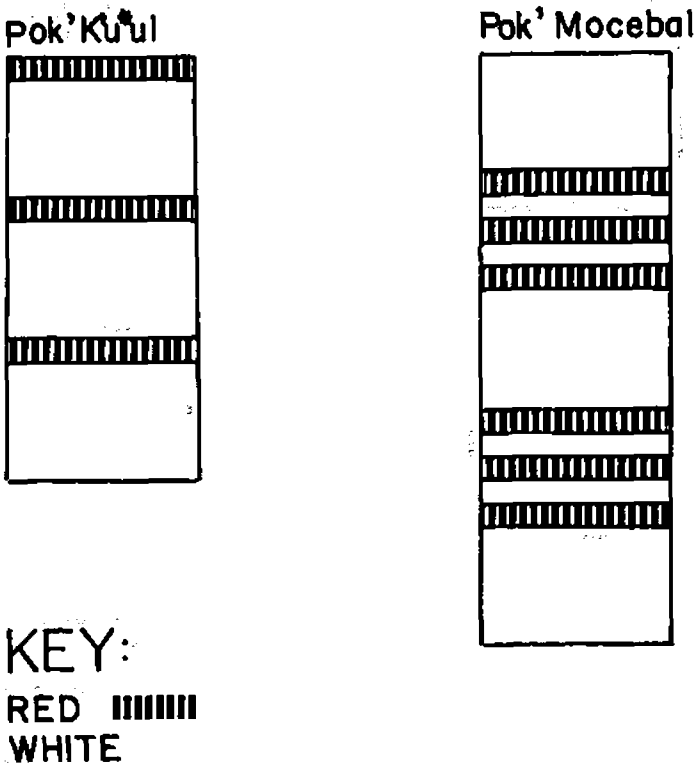

Figure 5. American college students' representations of the woven patterns

American college group differed significantly from both unschooled Zinacanteco weavers and schooled nonweavers in omitting the detailed depiction of individual threads from their analytic representations ($p < .01$, Fisher Test, two-tailed). In sum, this was the only group to use simplified or generalized pattern elements within the context of analytic representations which accurately preserved the configuration of stripes of the original material. A clue to the potential influence of specific training was provided by the remark of one student whose strategy differed somewhat from the majority of her group. A potential specialist in visual studies, she chose to differentiate the two patterns by width of stripes alone, saying that her art teacher was always telling her to simplify things and leave out unnecessary details. This student, like the other one using width of stripe to differentiate the two patterns, employed broad sticks to represent broad stripes. Note that Zinacanteco weavers were the only other group in which this representational strategy manifest itself.

Development of the Ability to Continue Patterns: Age, Sex and Schooling

Analysis of the children's performance on the seven pattern continuation tasks provides a general developmental context for their representation of the culture-specific woven patterns.

Age brings an increasing ability to continue patterns correctly, as Table 4 shows. In scoring performances on pattern continuations, we tried to give each child credit for what he was trying to do, rather than mark him totally incorrect for what might have been careless errors. We allowed up to three mistakes (only one mistake on Patterns 6 and 7 — the small number of sticks available made these patterns shorter) before scoring a continuation as incorrect. Among the unschooled children, the youngest fail to continue any patterns correctly; children at the middle age level complete an average of 4 out of 7 patterns correctly; and members of the oldest age group complete an average of 5 patterns correctly. These age differences are statistically significant at the .001 level according to the Mann-Whitney U Test.

The notion that knowing how to weave would, in itself, promote a general skill in pattern representation on the part of the girls is disconfirmed by the data. There are no statistically significant sex differences in the two younger age groups, but at adolescence the boys show a decided superiority in accurate pattern continuation (Table 4). This difference, significant at the .02 level according to the Manny-Whitney U Test (two-tailed), indicates that some factor is more important than weaving skill in promoting the general ability to represent linear patterns.

While we have seen that schooling exerts a strong influence on the representation of the familiar woven patterns, it has no effect on performance with novel patterns in the pattern continuation tasks. The schooled adolescent boys are no different from the unschooled adolescent boys in number of correct continuations: both groups complete about six patterns correctly, on the average (Table 4). Similarly, schooling has no effect on overall pattern continuation scores at the middle age level: both groups of boys complete an average of four out of seven patterns correctly.

Strategies of Pattern Representation

Underlying the development of the ability to complete patterns correctly is a sequence of distinct strategies of pattern representation. A strategy is an internally consistent approach to patterns that deviates in a systematic fashion from the model being represented. The strategies will be described in the developmental order revealed by our comparison of age groups. This order turned out to respresent a scale of increasing complexity and similarity to the models, such that older children's representations tend to preserve more aspects or features of the various patterns. Table 4

Table 4
DEVELOPMENT OF PATTERN REPRESENTATION:
AVERAGE FREQUENCY OF VARIOUS STRATEGIES USED BY CHILDREN IN DIFFERENT GROUPS TO CONTINUE PATTERNS

Strategies of Pattern Representation	4-5 yr old Girls & Boys (N = 12)	Unschooled groups 8-10 yr old Girls & Boys (N = 12)	13-18 yr old Girls (N = 9)	13-18 yr old Boys (N = 9)	Schooled groups 8-10 yr old Boys (N = 10)	Schooled groups 13-18 yr old Boys (N = 9)
Randon (applicable to all 7 patterns)	4.3	0.1	0.1	0.0	0.0	0.0
Consistent use of one color (applicable to all 7 patterns)	0.3	0.0	0.0	0.0	0.0	0.0
Representation of pattern color (applicable to patterns 3, 4, 5, 6, 7)	0.3	0.0	0.0	0.0	0.0	0.0
No two identical sticks adjacent (applicable to all 7 patterns)	0.5	0.1	0.1	0.0	0.0	0.0
Consistent representation of one pattern element whith inconsistent representation of other pattern element (8) (applicable to patterns 4, 5, 7, 8, 9)	0.5	0.4	0.3	0.0	0.3	0.0
Homogenization of pattern elements (applicable to patterns 4, 5, 7, 8, 9)	0.7	1.8	1.2	0.8	1.5	1.0
Quantitative reduction or expansion of pattern element (applicable to patterns 4, 5, 7, 8)	0.0	0.2	0.0	0.1	0.1	0.0
Free variation of similar colors (applicable to patterns 3, 4, 5, 6, 7)	0.3	0.7	0.7	0.0	1.0	0.0
Correct representation (applicable to all 7 patterns)	0.0	3.8	4.6	6.1[a]	4.1	6.0[a]

[a] Two of the 13 to 18 year-old boys were probably colorblind. Their responses were scored as correct since they made sense when green and red aticks were considered identical.

shows how frequently each of the various strategies was used for participants with and without school experience in each age group. At the oldest age level, strategies are presented separately for girls and boys.

Random. Random order of sticks was the dominant strategy of the youngest age group, just as in their representations of the woven patterns. Not only did almost all of them use it, but many did so with great persistency.

Consistent use of one color. Two of the youngest boys totally ignored the patterns started by the experimenter and put in all the sticks of one color that they could find. These continuations were the high points of their otherwise generally random performances.

Representation of pattern color. Two of the youngest girls used colors correctly, putting in only the colors used in the models, but did not create any discernible patterns with them. Each girl did this only twice. All of their other continuations were random.

No two identical sticks adjacent. This strategy, most prevalent with the youngest children, involves using sticks of all the different colors that were available — neither randomly nor with organized substitutions of colors, but by placing no two identical sticks next to each other. This strategy preserves the feature of stripedness without representing the color or pattern of the stripes.

Consistent representation of one pattern element with inconsistent representation of other element (s). This strategy was as frequent in the middle as in the youngest group. It consists of continuing a striped pattern by representing one aspect of the pattern accurately throughout but allowing other aspects to vary. Figure 6 shows two of these responses. In the first, a response to Pattern 4 (rrrw[7]), the subject retains only the numerically smaller element (w) of the pattern and treats the larger one (rrr) inconsistently. In the second example, a response to Pattern 8 (rrgrry), the subject represents the stable element (rr) accurately but is not able to cope with the alternating ones (g, y).

Homogenization of pattern elements. This strategy expresses an emphasis on qualities of the whole. By reducing the number of differentiated parts, the child represents only the more dominant aspects of the pattern. Figure 6 shows two different homogenizations of Pattern 5 (rrwrrww). The two children have both retained the most stable, and therefore the most striking, element of the pattern —the double red stripe— but have chosen different ways to cope with the alternating width of the white stripe in the repeating unit. Table 3 shows that this strategy rises sharply in frequency from the youngest to the middle age level and then declines somewhat among the oldest group. Homogenization is not replaced by another "error" strategy among the thirteen through eighteen year-olds, but rather by accurate continuations: indeed, six adolescents are able to continue all seven patterns correctly.

Quantitative reduction or expansion of a pattern element. A strategy involving quantitative change in an element of a pattern, but preserving all of its variable features, was used only four times — in four different patterns, and by four different boys (Figure 6). Such a small number indicates that the ability to represent a given element accurately is basic to the ability to represent differentiated elements of a pattern. Only in these four cases did the latter ability exist without the former.

Free variation of similar colors. For continuations of Patterns 3, 4, and 5, pink and orange sticks were available as well as red and white ones. An example of a pattern yielded by this strategy is shown in Figure 4. The last two patterns in the figure show

Patterns are symbolized in the text by the following scheme of abbreviation: r = red, w = white, g = green, y = yellow.

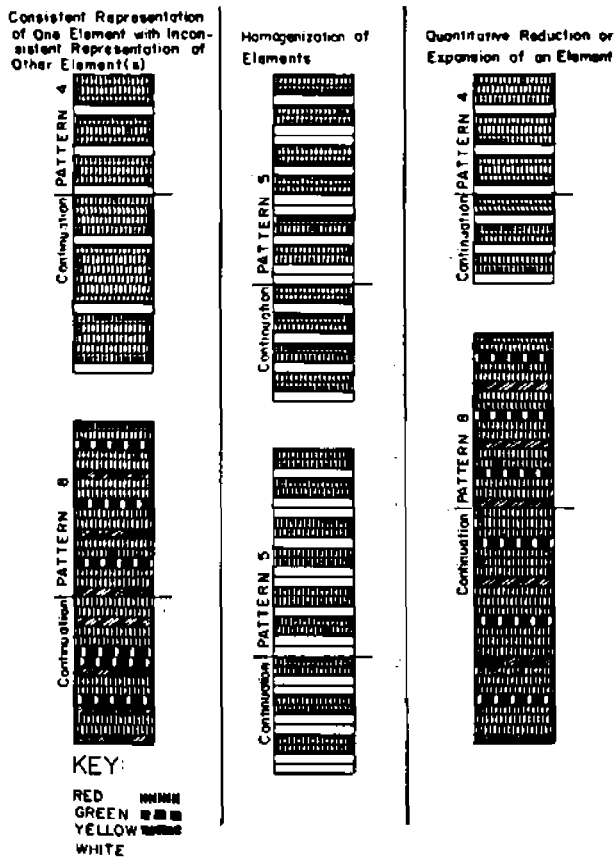

Figure 6. Strategies of pattern representation

substitution of pink for white and orange for red sticks in constructing a red and white alternating pattern. Table 4 shows that color substitution was equally frequent at all age levels, at least among the girls. Since Tzotzil speakers often use a single color term to encode this pink and white and another single term to encode this orange and red, the possibility of a relationship between color terminology and color use was suggested. Evidence relevant to testing this hypothesis will be presented later. Although blue and green are also denoted by the same term in Tzotzil, the use of blue sticks in the green and yellow patterns (5 and 6) only occurred once, perhaps because the shades were actually quite distinct. The fact that only three blue sticks were available may also have contributed to the small number of color substitutions for these patterns.

Number of Sticks Placed at a Time: A Measure of Cognitive "Chunks"

The manner in which children placed sticks in the frame —one at a time or in groups— seems to reveal something about the cognitive organization of their patterns. By putting sticks in as a group, a child indicates that he is able to predict parts of the

pattern; when his groupings relate to the pattern's structure, he shows that he has an organized mental concept of the pattern.

The frequency of the different types of stick groupings is displayed in Table 5. The youngest children, in addition to doing most of their patterns randomly, put in almost all of the sticks one-by-one. With age there is an increasing tendency for a child to place sticks in groups which corespond to stripes in his pattern. This developmental trend, significant .002 level by the Mann-Whitney U Test (two-tailed), parallels the greater ability of older children to be consistent and correct in their pattern completions. The schooled boys are not significantly different from the unschooled boys in terms of placement units. Thus, with age, the organization of the children's motor behavior comes to reflect the very structure of the pattern, specifically the differentiated elements of which it is constituted.

Comparison among the Patterns: The Role of Familiarity and Complexity

The effect of a shift from a familiar design in familiar colors (simple alteration of red and white — Pattern 3) to the same design in a new color context (green and yellow — Pattern 6) is masked by another effect. The similarity of the colors available for the red and white pattern (and perhaps also the large number of orange and pink sticks) seems to have made it more difficult. Children often made substitutions of pink for white and orange for red. If, however, one controls for this factor by disregarding these substitutions of pink for white and orange for red, then the new color context causes great difficulty for the youngest children and much less in the two older groups. This effect is displayed in Table 6. In the youngest group, three boys succeded with an alternating dark and light pattern with a red and white model; none could produce such a pattern with a green and yellow model. The negative effect of a new color context, while not occurring for all children, is a reliable one according to the sign test ($p = .016$, one-tailed test).

The patterns can also be considered in terms of complexity (Table 1). The first shifts toward greater complexity occur in the transitions from Pattern 3 (rw) to Pattern 4 (rrrw, and from Pattern 6 (gy) to Pattern 7 (gggy). Complexity stems from adding a second feature, number, to the first feature, color, which differentiates the two elements of Pattern 3 (rw) and Pattern 6 (gy). This shift in complexity is confounded with a shift away from cultural familiarity — in fact, Pattern 4 (rrrw) constitudes a color reversal of the *pok' k'u*ul* configuration. Some children who could deal with Pattern 3 (rw) cannot deal with Pattern 4 (rrrw) (Table 5). Some of the younger children fail to represent the greater degree of differentiation of elements within this pattern. This effect, manifest in the simplification strategies discussed earlier, is also a reliable one according to a sign test ($p = .008$, onetailed). The effect, however, does not manifest itself in the green an yellow patterns. (Pattern 6 vs Pattern 7). A possible explanation is that the complexity added by making number a variable in the pattern is less important than the confusion caused by reversing the figure-ground relationship of the familiar red and white striped pattern. Problems involving transformation of the familiar may cause more difficulty in a traditional society than a totally foreign problem of equal complexity.

The second shift —to a repeating unit consisting of three differentiated elements (Pattern 5, rrwrrww; Pattern 8, rrgrry)— had a larger effect. On both Pattern 5 (rrwrrww) and Pattern 8 (rrgrry) the eight-to ten-year-olds show a definite drop in competence from each of the preceding patterns (Table 5). These drops are reliable according to a sign test ($p < .02$, one-tailed). (The drop in accurate reproduction from Pattern 7 to Pattern 8 occurs, despite the fact that only sticks of the correct colors were available for Pattern 8 whereas sticks of colors not appearing in the model were available for Pattern 7.

Table 5
AVERAGE PORCENTAGE OF STICKS USED IN PLACEMENT UNITS OF DIFFERENT TYPES BY CHILDREN OF DIFFERENT AGES AND EDUCATIONAL EXPERIENCE

	Unschooled boys and girls			Schooled boys	
	Age 4 to 5 N = 12	Age 8 to 10 N = 12	Age 13 to 18 N = 18	Age 8 to 10 N = 10	Age 13 to 18 N = 9
Average percentage of aticks put in singly	94%	86%	69%	84%	56%
Average percentage of sticks put in two or more at a time as parts of stripes	2%	5%	3%	3%	4%
Average percentage of sticks put in two or more at a time as whole stripes	2%	9%	26%	13%	30%
Average percentage of sticks put in two or more at a time as contrasting stripes	2%	0%	2%	0%	9%
	100%	100%	100%	100%	100%

Table 6
PERCENTAGE OF CHILDREN IN DIFFERENT GROUPS CORRECTLY CONTINUING VARIOUS STRIPED PATTERNS WITH AND WITHOUT EXACT COLORS

	Unschooled groups				Shooled groups	
Pattern[a]	4-5 yr old Girls & boys (N = 12)	8-10 yr old Girls & boys (N = 12)	13-18 yr old Girls (N = 9)	13-18 yr old Boys (N = 9)	8-10 yr old Boys (N = 10)	13-18 yr old Boys (N = 9)
3[b]	25%	100%	100%	100%	100%	100%
4	8%	75%	100%	100%	80%	100%
5	0%	25%	56%	89%	50%	56%
6	0%	92%	78%	100%	100%	100%
7	0%	100%	78%	100%	90%	100%
8	0%	42%	89%	100%	70%	100%
9	0%	8%	22%	22%	20%	44%

[a] Patterns are illustrated in Figures 2 and 3.

[b] Arrows join patterns that are identical (3 and 6, 4 and 7) or similar (5 and 8) in structure but vary in color.

The frequency of the homogenization strategy in response to Patterns 5 and 8 shows that children try to reduce them to two-element patterns.

In the oldest group, there is a significant drop in correct completions with Pattern 5 (p = .03, one-tailed sign test) but not with Pattern 8. For the whole sample, in fact, Pattern 8 is easier than Pattern 5; the probability of the observed difference between the two patterns occurring by chance is .004 (two-tailed sign test). In the context of this experiment there is no way of deciding whether the lesser difficulty of Pattern 8 relative to Pattern 5 stems from the nature of the two patterns (color alternation in Pattern 8 vs number alternation in Pattern 5) or from the nature of the available sticks. (Only the correct sticks were avaiatble for Pattern 8, unlike Pattern 5).

Pattern *complexity*, measured in terms of the number of differentiated pattern elements, causes more representational difficulty than pattern *unfamiliarity*. A comparison of the results for Patterns 3, 4, and 5 demostrates this point. If pattern familiarity were the more critical factor, the shift from Pattern 3 (rw) to Pattern 4 (rrrw) would cause a greater decrement in performance than the shift from 4 (rrrw) to 5 (rrwrrww). It is clear from Table 6 that the opposite is true; and this difference in the decrements is significant at the .004 level (two-tailed sign test).

Pattern 9, the growing pattern shown in Figure 3, was definitely the most difficult one for all of the groups (Tabla 6). This pattern involves four values a long the dimension of number and eight different parts in all; attempts to reduce the pattern to fewer elements were frequent. There was a tendency for the older schooled boys to do better on this pattern, but it did not attain statistical significance. Interestingly enough, however, the only participants in Navencavuk who responded to the pattern with a progressive solution (Figure 3), that is, by continuing its growth, were boys with school experience, one at the oldest age level, one at the middle age level. Thus, schooling may encourage

the formulation of an abstract principle that goes beyond the information given, generating a solution which transcends the concrete characteristics of the model.

Both the oldest girls who successfully completed the growing pattern used a mirror image solution (Figure 3). The choice of this solution may be related to the nature of Zinacanteco woven patterns, in which thin striped borders are placed symmetrically at both edges of a piece of cloth. Again, weaving seems to produce a *specific effect* rather than a *general pattern skill*.

Color Terminology and Use of Color in Patterns

We sought an explanation for the commonly ocuring substitutions of pink for white and orange for red in the pattern continuations. Pink and white, orange and red, were often in free variation in the children's representations of the woven patterns, as well. Tzotzil has five basic color terms; a single color term is usually used to describe our pink and white sticks, another single term to describe our orange and red sticks. Nevertheless, it is possible to label the color of each stick distinctively by adding diminutive suffixes or using Spanish loan-words. We wondered if there might be a correlation between the ability of a child to encode similar colors distinctively and his differentiation of these colors in pattern continuations. At the end of the experiment each child was asked to name the color of each type of stick; Table 7 shows the obtained relationship between verbal encoding of related colors and the use of these colors in the pattern continuations. (The use of English color terms in this section, as elsewhere, describes the sticks as an English-speaking person would, nothing more. This non-technical way of referring to the colors of the sticks suffices for purposes of this experiment.) While the use of color in the youngest children's patterns seems independent of color terminology, the performances of the older children appear more clearly related to the distinctiveness of their encodings.

Eighty percent of the eight-to ten-year-olds who fail to describe the pink and white sticks in a distinctive fashion use pink and white sticks interchangeably in forming stripes; only 50% of the eight-to ten-year-olds who give distinctive descriptions of the pink and white sticks make these substitutions. Similarly, substitutions of orange for red sticks are made by 100% of the eight-to ten-year-olds who give non-distinctive descriptions of the orange and red sticks, and by only 33% of those who give distinctive descriptions.

In the thirteen- to eighteen-year-old group of unschooled boys and girls 73% of the children with non-distinctive encodings for the pink and white sticks make corresponding substitutions in their patterns, as compared to 30% of those with distinctive encodings. All the thirteen-to eighteen-year-olds who fail to describe the orange and red sticks distinctively substitute orange sticks for red sticks in their patterns; only one-third of those with distinctive descriptions do so. All but one of the thirteen-to eighteen-year-old schooled boys distinctively encode both the pink and white and the orange and red sticks; and there are almost no color substitutions in this group. But the relation between terminology and color use is weakest among the eight- to ten-year-old schooled boys (Table 7). Perhaps this group is learning Spanish terminology in school, but has not yet mastered its referential properties. Nevertheless, looking at the association between distinctive color terms and distinctive color use for the two older groups of unschooled children combined, we find that there is a reliable correlation between non-distinctive (or incorrect) encoding of pink and white and the substitution of pink for white in pattern continuations ($x^2 = 5.1$, $p < .025$, one-tailed). Similarly, we find a reliable correlation between non-distinctive encoding of orange for red in pattern continuations ($p < .05$, one-tailed Fischer Test). The language of the distinctive terms

Table 7
PERCENTAGE OF CHILDREN IN DIFFERENT AGE GROUPS WITH AND WITHOUT DISTINCTIVE COLOR ENCODINGS WHO MAKE CORRESPONDING SUBSTITUTIONS IN CONTINUATIONS OF RED AND WHITE PATTERNS

	Unschooled girls & boys			Shooled boys	
	Age 4-5	Age 8-10	Age 13-18	Age 8-10	Age 13-18
	Pink-white substitutions in pattern continuations				
Distinctive color enconding of pink and white sticks	100%	50%	30%	67%	0%
N	2	8	20	3	11
Nondistinctive (or incorrect) color encoding of pink and white sticks	100%	80%	73%	71%	0%
N	2	5	11	7	1
	Orange-red substitutions in pattern continuations				
Distinctive color encodings of orange and red sticks	100%	100%	100%	67%	9%
N	3	5	2	6	11
Nondistinctive (or incorrect) color enconding of orange and red sticks	—	33%	33%	50%	0%
N	0	9	27	4	1

does not matter: Tzotzil diminutives and Spanish loan-words are equally effective; distinctive and specific encoding is the crucial factor.

At this point we wondered whether color substitutions in the patterns were a matter of representational preference or discrimination failure. We therefore did another experiment in which children who had made pink-white or orange-red substitutions in their pattern continuations were asked to sort sixteen sticks by color, matching four standards set up in different locales —a basket, small pail, large pail, and tortilla table. The four colors were pink, white, orange, and red. Twelve children participated in this experiment, five eight— to ten-year-olds and five thirteen —to eighteen-year-olds without school experience and two eight— to ten-year-olds with school experience. Eleven out of the twelve children sorted without error. Thus, free substitution of pink for white and orange for red in pattern continuation and representations is not based upon an inability to discriminate these colors.

Summary and conclusions

The Role of Weaving Skill

Knowledge of weaving has a large degree of influence on the representation of Zinacanteco clothing patterns. Pattern analysis, more frequent among the weavers,

appears to reflect the perceptual requirements of the task in wich the patterns are embedded.

Since analytic representations were constructed by two girls who had never created the two patterns by winding warps for them in the actual weaving process, it is impossible to conclude anything about the relation of pattern representation to the weaving skill itself. A later, unpublished, study of how Zinacanteco girls actually learn to weave does, however, support the idea that girls have already learned how to carry out a great deal of the process before they sit down to weave their first piece of cloth.

The weavers also tended to use wide sticks to represent a stripe composed of a number of threads, whereas the nonweavers more frequently used several sticks placed next to each other. Thus, knowing how a woven pattern is constructed apparently can lead to a more generalized concept of the pattern, as well as foster a more analytic representation. While these two characteristics of the weavers seem somewhat contradictory, pattern analysis and generalization can be integrated, as the performance of the American college students shows, for they used generalized stripes while accurately representing the configuration of stripes in both woven patterns. Originally it was thought that weavers might use a group of narrow sticks of the same color to represent a single stripe, just as a woven stripe is composed of a number of individual threads of a single color. But this was not the case, for the nonweaving Zinacanteco boys used narrow sticks to represent broad stripes more frequently than the weaving girls. Consequently it seems as though the effect of weaving knowledge on the conceptualization of woven pattern lies more in the analysis of pattern configurations than in the detailed representation of threads per se.

The high frequency of analytic representations among the weavers confirms the notion that a craft develops the component cognitive abilities necessary to its performance. This effect of weaving knowledge on the representation of woven patterns currently parallel the effects of pottery making knowledge on conservation of clay substance in Price-Williams et al's (1967) study. Generalized representation of individual stripes through the use of broad sticks, on the other hand, would seem to constitute a cognitive *effect* rather than a *component part* of the weaving process itself.

Knowledge of weaving did not, however, foster a general proficiency in the representation of linear patterns, as manifest in the continuation tasks. One possible explanation is that the girls did not weave enough for their skills with patterns to become generalized. This interpretation is suggested by the Mexican study of Price-Williams, Gordon, and Ramirez (1967). They found that where young boys were very actively involved in pottery making, such as occurs when the skill is commercialized, the conservation of clay substance generalized to other types of conservation concepts such as weight and volume. In contrast, where boys were less actively engaged in pottery making, clay substance was the only conservation concept to reflect the influence of the potting skill.

But the fact that the weavers (unschooled female adolescents in our study actually performed more poorly on pattern continuations than the comparable nonweavers unschooled male adolescents, belies any interpretation based simply on amount of weaving experience. Perhaps the crucial factor is that Zinacanteco culture develops cultural problem solving skills more in Zinacanteco males than females, particularly the skills useful in carrying out economic transactions. Even in the study of Price-Williams and his colleagues, degree of pottery making experience seemed to be confounded with the amount of commercial activity in which it was involved.

Perhaps, then, practical experience develops *specific* component cognitive skills —as in Mexican weavers (our study and potters (Price-Williams et al., 1967)— whereas other more general cultural influences, economic activity for instance, develops more general cognitive performance— the representation of novel patterns by adolescent

boys in our study; the conservation of liquid quantity and other conservation concepts in the Price-Williams et al. (1967) study. Other studies are needed to unravel the precise nature of the environmental forces which lead to the generalization of cognitive skills.

Developmental Stages of Pattern Representation

Our results demonstrate with striking clarity that pattern representation is subject to seemingly universal stages of organization and that the effects of culture-specific experiences are shaped and delimited by these general developmental processes. Werner has applied his general theory of comparative mental development to the sphere of perceptual representation. In his view this development proceeds from diffuse organization characterized by "qualities-of-the-whole" to an organization in which the essential feature is a "decisiveness of parts standing in clear relation" (1948, page 112).

We have seen that, whereas older Zinacanteco children may copy a given pattern accurately, younger children will represent only its dominant features. The Zinacanteco child solves the problem of complexity by reducing different parts, either by ignoring them or by making them identical to other parts.

The Role of Formal Schooling

Schooling did not have any definite effect on the growth of representational skill as manifest in performance on the pattern continuation problems. This result is quite different from Greenfield's earlier findings among the wolof in Senegal, where schooling produced a striking effect on cognitive development (Greenfield, 1966, Greenfield, Reich, and Olver, 1966.) The position of formal education there was similar to its place in Zinacantan, for schooling introduced a written language into an otherwise oral culture.

A possible explanation of the difference in schooling's effect in the two cultures is that an emphasis on general problem solving skills is encouraged in the indiginous Zinacanteco, but not Wolof, culture and that these skills are therefore not augmented by low quality formal schooling in Zinacantan. This interpretation was suggested by Greenfield's informal comparison of the two cultures and is supported by the informal observations of Miyamoto,[8] the only other investigator familiar with both the Zinacantecos and the Wolof.

Only in the response to the growing pattern was there a suggestion that school experience might make a difference to the representation of novel patterns. Two schooled boys were the only participants who made this pattern "grow" beyond the concrete details of the model. Zinacanteco culture places great stress on doing things the "true" (*baz'i*) way. Very likely most children treated our model of the growing pattern as something to be emulated rather than extended. But School, with its emphasis on learning principles transferable to any context, could be erosive of the notion of the *baz'i* way. Two of the schooled boys did, in fact, formulate the principle behind our pattern and used this principle to develop the pattern beyond our model, rather than merely copying it.

Although school performance had minimal effect on pattern representation in general, it had a large effect on representations of the two Zinacanteco woven patterns. This outcome was quite unforseen. At the middle age level boys with school experience more frequently differentiated the two patterns; at the oldest age level, they represented the thread-by-thread configuration as often as the female weavers. Perhaps schooling

[8] Personal communication, 1971.

induces operations which make it possible to translate a principle from one medium —the woven material— to a different one, wooden sticks in a frame. In our experiment, only the woven patterns demanded this translation, and these patterns were the only ones to elicit substantial differences between schooled and unschoooled groups. In fact, an intrinsic characteristic of reading and writing is translation between two media, the oral and the visual. Because this translation aspect of schooling would be present wherever reading and writing were taught, even when schools were of low quality, it seems a reasonable account of the means by which formal schooling influences representation of the woven patterns.

Color Lexicon and the Use of Color in Patterns

A whole range of studies have focused on the relationship between color lexicon and nonlinguistic behavior relating to color, in attempts to test out the Whorfiam hypothesis that language determines thought. The relationships observed in these experiments between language variables and cognitive variables have been, in general, small or nonexistent; this body of research is summarized and discussed by Greenfield and Bruner (1969). On an overall cultural level, the Zinacantecos' use of the color in patterns and its correspondence to Tzotzil terminology seems to constitute the most striking correlation between color terminology and nonlinguistic behavior ever noted. Zinacantecos at all ages frequently substituted pink for white and orange for red. Light pink and white are both covered by the basic color term *sak* in Tzotzil, orange and red by the term *zoh*. The U.S. college students, speakers of a language in which each pair of colors is denoted by a pair of basic color terms, rarely used pink and white sticks or orange and red sticks in free variation in their patterns. The reason for this seemingly large correlation between lexicon and cognitive behavior might be that our task was a representational one, therefore offering a choice of appropriate responses without becoming a culturally ambiguous task. To our best knowledge no other study has ever used an esthetic problem to study the relationship between language differences and nonverbal thought. Supporting evidence that to some degree participants "choose" to ignore fine color discriminations for the purpose of the representational task comes from the control experiment in which these fine discriminations were clearly required. There the very same children who had substituted pink for white or orange for red in constructing their patterns discriminated all four colors perfectly. Although Tzotzil lacks basic color term to distinguish pink from white and orange from red, it is possible for a Zinacanteco to encode each color linguistically, either by modifing the basic color terms or by using Spanish loan-words. On the level of individuals there was a very imperfect buy statistically significant relation between color substitutions in pattern construction and non-distinctive encoding of the relevant colors.

In our study two strong qualitative relationships between culture and cognition have appeared — between experience with clothing and its representation and between the language of color and its use in patterns. Perhaps the realm of esthetic representation, where choice is real rather than illusory, is the ideal domain for demonstrating the cognitive implications of different world views.

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RELAÇÃO ENTRE SEXO E CLASSE SOCIAL DA CRIANÇA E O SEU DESEMPENHO E ATRAÇÃO POR UM BRINQUEDO CONSIDERADO ADEQUADO, NEUTRO, OU INADEQUADO A SEU SEXO

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Neste estudo, investigou-se o desempenho e atração por um brinquedo apresentado às crianças como adequado, neutro ou inadequado a seu sexo em uma amostra de crianças de ambos os sexos de classe média e classe baixa. O brinquedo utilizado foi imaginado pelos autores do presente trabalho, devido à necessidade de um brinquedo desconhecido para a amostra. Análises de variância com tres fatores —classe social, instruções e sexo— foram utilizadas para avaliar tanto a atração quanto o desempenho. Variáveis culturais foram introduzidas para explicar os resultados obtidos, os quais diferem marcadamente de resultados de estudos nesta mesma área realizados nos Estados Unidos.

In this study, the performance and attraction in a game presented to the child as adequate, neutral ou inadequate to his sex were investigated in a sample of boys and girls, half from the middle class and half from the lower class. The game was created by the authors of the present study, due to the need of a game completely unknown to the sample. Analyses of variance with three factors — social class, instructions and sex were used to evaluate both the attraction and the performance. Cultural variables were introduced to explain the results obtained, which differ significantly from results in this same area obtained in the United States.

Diferenças comportamentais podem ser observadas desde muito cedo entre crianças do sexo masculino e feminino. Existe uma expectativa geral para que a criança exiba comportamentos diferentes e asuma diferentes papeis dependendo de seu sexo. Pesquisas correntes (Hetherington, 1970) indicam que os pais ensinam a seus filhos a se comportar como meninos ou meninas, reforçando comportamentos apropriados a seu sexo e punindo comportamentos característicos do sexo oposto. Isto ocorre particularmente com crianças do sexo masculino. Embora o mesmo processo ocorra no caso de crianças do sexo feminino, parece que estas sofrem menos pressões para se enquadrar em um modelo de comportamento feminino. Talvez devido ao status superior masculino adicionado à maior pressão inicial para os meninos adotarem padrões de masculinidade, as pesquisas têm mostrado que os meninos desenvolvem mais cedo uma preferência pelo papel masculino do que as meninas pelo papel feminino (Brown, 1957). Pesquisadores americanos observaram também diferenças nas preferências por papeis masculinos e femininos entre diferentes classes sociais. Rabban (1950) observou, por exemplo, que meninos de classe baixa apresentavam uma preferência mais acentuada por brinquedos considerados como próprios para o seu sexo por volta de 4—5 anos, meninas de classe baixa e meninos de classe média por volta de 7 anos e meninas de classe média por volta de 9 anos.

Apesar da literatura crescente nesta área, poucos dados existem a respeito de como um rótulo de apropriado ou não ao sexo do sujeito dado a uma determinada atividade tem influência no comportamento subsequente de crianças de diferentes classes e de diferentes culturas. Alguns pesquisadores americanos (Liebert, McCall e Hanratty, 1971 e Montemayor, 1974), manipulando experimentalmente informações a respeito da adequabilidade ou não de certos brinquedos ao sexo do sujeito, observaram uma preferência por brinquedos considerados adequados a seu sexo. Isto foi observado tanto em amostras femininas quanto masculinas.

O presente trabalho tem como objetivo verificar se essa preferência e se também o desempenho de crianças de classes média e baixa, em um brinquedo classificado como apropriado, neutro ou inapropriado para o seu sexo, variam conforme instruções recebidas. Ele constitui, pois, uma tentativa de se estudar as relações existentes entre desempenho e preferência por um brinquedo e o seu rótulo de apropriado, neutro ou inapropriado ao sexo da criança utilizando-se como sujeitos crianças de duas classes sociais diversas. Foi predito que tanto o desempenho quanto a atração pelo brinquedo variariam de acordo com orótulo do mesmo como apropriado, neutro ou inapropriado ao sexo das crianças independentemente de suas classes sociais.

Método

Sujeitos

Os sujeitos foram 60 meninos e 60 meninas. Metade das crianças de ambos os sexos pertenciam à classe social baixa e metade à classe média. Todas as crianças eram alunos de 1ª e 2ª séries da escola elementar, com idade entre 6 anos e meio à 9 anos (X : 7.6 anos). As crianças da classe média pertenciam todas a uma mesma escola pública e foram escolhidas por suas professoras com base no conhecimento de sua classe social. As crianças de classe baixa foram escolhidas em uma escola pública que atendia apenas a crianças de baixo nível sócio-econômico.

Instrumentos

O brinquedo. O brinquedo utilizado foi um boneco a que se chamou "Pisca-Pisca". Este foi imaginado pelos autores do presente artigo, os quais procuraram criar um brinquedo que fosse totalmente novo para as crianças e que não fosse específico para um determinado sexo. O Pisca-Pisca é um boneco de madeira de aproximadamente 1.20 metros de altura, tendo no centro do corpo um disco e nos olhos duas pequenas luzes. A tarefa da criança consistia em atirar de uma distância de 1.80 m uma pequena bola de borracha que, ao atingir o disco do corpo do boneco fazia com que os seus olhos se acendessem por um curto período. Esta distância de 1.80 m fou escolhida com base nos resultados prévios de uma amostra de 20 crianças na mesma faixa etária dos sujeitos do presente experimento. O número de tentativas permitido para cada criança era 10, havendo antes 3 lançamentos considerados como treino.

A escala de atração. Para se verificar a atração pelo brinquedo foi utilizada uma escala semalhante a utilizada por Montemayor (1974). Esta consistia de uma linha dividida em 6 partes iguais e numerada de —3 a +3. Na extrema direita da escala, estava desenhado um rosto de uma criança alegre e risonha e na extrema esquerda um rosto fazendo careta e pondo a língua de fora.

Na utilização da escala, pedia-se inicialmente à criança para dizer o brinquedo de que mais gostava, escrevendo o seu nome na extrema direita, na altura do número

+3. Em seguida, pedia-se à criança para dizer o brinquedo que mais detestava, escrevendo o seu nome na altura do número —3 na extrema esquerda. Em seguida, mostrava-se à criança os espaços da escala correspondentes aos diferentes graus de atração e ela deveria terminar de preencher indicando um brinquedo muito bom (+2), um outro bom (+1), um ruim (—1) e um muito ruim (—2). Finalmente ela deveria indicar um brinquedo neutro que não gostava nem disgostava. Após completar a escala, pedia-se, então, à criança para indicar onde ela localizaria o brinquedo Pisca-Pisca na mesma.

Procedimento

Tanto as crianças do sexo masculino quanto do sexo feminino da classe média foram distribuídas aleatoriamente a três condições diversas — condição neutra, masculina e feminina. O mesmo ocorreu com as crianças de classe baixa.

No momento de utilizar o brinquedo, as crianças eram retiradas individualmente de suas salas de aula, sendo encaminhadas para uma outra sala onde se encontrava o boneco e onde recebiam instruções diversas dependendo da condição a ue tinham sido designadas.

Os *meninos* da condição neutra (10 da classe média e 10 da classe baixa) receberam as seguintes instruções:

"Este é o Pisca-Pisca. É um brinquedo novo e os fabricantes nos pediram para experimentá-lo para ver se vocês crianças gostariam de brincar com ele. Você quer nos ajudar brincando um pouquinho com o Pisca-Pisca? O brinquedo consiste no seguinte: Você deverá tentar atingir com esta bola o disco do corpo do boneco, quando, então, os seus olhos piscarão. Você poderá experimentar inicialmente três vezes. Somente depois é que começaremos a contar o número de pontos quando você deverá jogar 10 vezes".

Os *meninos* da condição masculina receberam as seguintes instruções:

"Este é o Pisca-Pisca. É um brinquedo para meninos tal como futebol, bola de gude, etc. Os fabricantes gostariam de saber se os meninos gostariam de brincar com o Pisca-Pisca. Você quer nos ajudar, brincando um pouquinho com o Pisca-Pisca? O brinquedo consiste no seguinte: Você deverá tentar atingir com esta bola o disco do corpo do boneco, quando estão o boneco piscará. Você poderá experimentar inicialmente 3 vezes. Somente depois é que começaremos a contar o número de pontos quando você deverá jogar 10 vezes".

Finalmente, para o terceiro grupo de 20 meninos (10 de classe média e 10 de classe baixa), as seguintes instruções foram dadas (condição feminina):

"Este é o Pisca-Pisca. É um brinquedo novo, próprio para meninas. Os fabricantes gostariam de saber, entretanto, se também os meninos gostariam de brincar com ele. Você deverá tentar atingir com esta bola o disco do corpo do boneco, quando, então, o boneco piscará. Você poderá experimentar inicialmente três vezes. Somente depois é que começaremos a contar o número de pontos, quando você poderá tentar 10 vezes".

As *meninas* receberam instruções semelhantes, invertendose apenas as condições quando apropriadas ou não.

Após a criança realizar 3 tentativas de treino e mais 10 tentativas, ela era, então, levada até uma mesa na mesma sala para responder a escala de atração.

Resultados

Desempenho. Cada criança recebeu um escore que correspondia a seu número de acertos no jogo (número de vezes que havia acertado no disco do boneco). Os resultados médios e desvios-padrão se encontram na Tabela 1.

Tabela 1
MÉDIA O DESVIO-PADRÃO PARA A PERFORMANCE

	Rótulo Recebido					
	Masculino		Neutro		Feminino	
	M	DP	M	DP	M	DP
Classe Social Média						
Meninos	4.8	1.5	4.5	1.9	6.0	1.9
Meninas	3.6	1.8	3.4	1.4	3.0	1.0
Classe Social Baixa						
Meninos	5.8	2.4	5.9	2.4	7.6	1.0
Meninas	4.6	2.3	5.6	2.3	5.5	1.2

Os resultados da análise de variância para performance indicaram que o fator classe social foi significante, $F(1,108) = 20.80$, $p < .001$, tendo as crianças de classe baixa uma performance superior àperformance das crianças de classe média. Também o fator sexo foi significante, $F(1, 108) = 17.51$, $p < .001$, tendo as crianças do sexo masculino uma performance superior a do sexo feminino. A interação esperada entre o sexo do sujeito e o rótulo do brinquedo de apropriado, neutro ou inapropriado ao sexo da criança não foi significante.

Grau de atração pelo brinquedo. No Tabela 2, são apresentados as médias e desvios-padrão para a escala de atração. Esta, como já foi descrita, variava de —3 a +3.

Tabela 2
MÉDIA E DESVIO-PADRÃO DA ATRAÇÃO PELO BRINQUEDO

	Rótulo Recebido					
	Masculino		Neutro		Feminino	
	M	DP	M	DP	M	DP
Classe Social Média						
Meninos	1.9	1.8	2.8	0.4	2.7	0.4
Meninas	2.8	0.4	1.8	0.8	2.3	0.7
Classe Social Baixa						
Meninos	2.9	0.3	1.6	1.9	1.1	2.2
Meninas	2.6	0.6	2.9	0.3	2.7	0.4

Os resultados da análise de variância na escala de atração revelaram uma interação significante entre classe social e instruções, $F(2,108) = 3.38$, $p < .05$. Para as crianças de clase média não houve diferenças no grau de atração conforme diferentes rótulos

recebidos. Entretanto, para crianças de classe baixa, o brinquedo foi considerado como mais atraente quando rotulado como próprio para o sexo masculino do que quando rotulado neutro ou apropriado para o sexo feminino.

Também significante foi a interação classe social e sexo, $F(1, 108) = 4.62$, $p < .05$. Para as crianças de classe média não houve diferença no grau de atração pelo brinquedo entre meninos e meninas. Entretanto, na classe baixa, o brinquedo foi considerado como mais atraente pelas meninas, independentemente das instruções recebidas.

Os resultados da análise de variância revelaram também uma interação significante entre classe social, instrução e sexo, $F(2, 108) = 13.46$, $p < .001$. Para os meninos de classe média, os escores de atração nas condições feminina e neutra não diferiam significantemente entre si, mas o grau de atração em ambas as condições foi significantemente superior ao observado na condição masculina. Para as meninas, o inverso ocorreu. O brinquedo foi considerado como significantemente mais atraente quando recebeu o rótulo de adequado as crianças do sexo masculino e menos atraente na condição neutra e feminina. Para os meninos de classe baixa, os escores de atração na condição masculina foi significantemente superior aos escores de atração das duas outras condições, não variando, porém, a atração de acordo com o rótulo recebido, no caso das meninas pertencentes a esta classe.

Discussão

Um dos aspectos que o presente trabalho se propôs a investigar foi a relação existente entre informações apresentadas a crianças do sexo masculino e feminino de classe social média e baixa a respeito da adequabilidade ou não de um brinquedo ao sexo da criança e seu desempenho e atração pelo brinquedo. Os resultados mostraram, entretanto, que a performance das crianças não variou de acordo com o rótulo do brinquedo como apropriado, neutro ou inapropriado ao próprio sexo. O que pôde ser observado foi uma performance superior no brinqueado quando o mesmo foi rotulado como apropriado ao sexo feminino, tanto por parte de meninos da classe média como os de classe baixa.

Este resultado pode, talvez, ser explicado não pela preferencia por atividades típicas do próprio sexo, mas sim devido à uma aprendizagen anterior de que o homem é mais capaz do que a mulher, sendo o menino desde cedo pressionado a se sair melhor do que as meninas em diversas atividades, incluindo jogos. Consequentemente, os meninos podem ter se sentido na obrigação de se sair muito bem no brinquedo quando o mesmo foi indicado como adequado a crianças do sexo feminino. Já a performance das crianças do sexo feminino não variou de acordo com as instruções recebidas.

Os resultados mostraram também uma performance superior das crianças de classe baixa independentemente do rótulo recebido. Isto pode ser explicado talvez pelo tipo de brinquedo que as crianças das duas classes têm hábito de brincar. Enquanto as crianças de classe média tem uma grande variedade de brinquedos, distribuindo as crianças de sua classe os seus momentos de brincadeira entre brinquedos de diferentes tipos, as crianças de classe baixa dispõem apenas de um número muito reduzido de brinquedos, muitos deles improvisados e de natureza mais semelhante aos aqui utilizados, como jogar pedrinhas numa lata vazia a uma certa distância, acertar uma pedra numa árvore, o que explicaria o desempenho superior das crianças de classe baixa no presente estudo.

Com relação à atração pelo brinquedo, observou-se uma interação de segunda ordem, indicado que apenas para os meninos de classe baixa, o brinquedo foi considerado como mais atraente quando rotulado como adequado ao sexo masculino. Para as crianças de classe média, o brinquedo foi também considerado como mais no brinquedo não foi afetada na direção esperada. O que pôde ser observado foi uma

performance superior no brinquedo quando o mesmo foi rotulado como apropriado ao sexo feminino, tanto por parte de meninos da classe média como os de classe baixa.

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Com relação à atração pelo brinquedo, observou-se uma interação de segunda ordem, indicando que apenas para os meninos de classe baixa, o brinquedo foi considerado como mais atraente quando rotulado como adequado ao sexo masculino. Para as crianças de classe média, o brinquedo foi também considerado como mais atraente pelas meninas para as quais foi dito que o brinquedo era apropriado ao sexo masculino e para os meninos, os quais foram informados de que o brinquedo era apropriado ao sexo feminino ou neutro.

O fato de o brinquedo ser considerado mais atraente pelas meninas de classe média quando o mesmo foi apresentado como apropriado ao sexo masculino talvez se explique pelo status superior masculino e pelo maior número de privilégios de homem em nossa sociedade, dos quais a menina de classe média tem consciencia desde cedo. Consequentemente, as atividades próprias para o sexo masculino seriam vistas também como mais atraentes pelas meninas da classe média. Resultados semelhantes a estes foram observados também na cultura americana por Brown (1958) e Hetherington (1965), os quais verificaram que as meninas preferiam itens masculinos de um teste de masculinidade-feminilidade (It Test até por volta dos 10 anos quando, então, uma rápida mudança nas escolhas femininas se fazia sentir

Entretanto, a maior atração pelo brinquedo quando o mesmo foi apresentado como apropriado ao sexo feminino ou neutro pelos meninos da classe média é difícil de explicar Talvez, devido à natureza do brinquedo - jogo a que se atribuía um escoreos meninos possam ter se sentido ameaçados de ter uma performance baixa na condição masculina, uma vez que num brinquedo próprio para meninos eles deveriam se sair bem. Este sentir-se ameaçado talvez tenha sido o responsável pela avaliação do brinquedo como menos atraente na condição masculina do que nas outras duas condições.

Esses resultados mostram que de modo geral, as relações entre rótulo e desempenho e atração não são tão simples e diretas como à primeira vista poderiam parecer e como estudos realizados nos Estados Unidos (Liebert, McCall e Hanratt, 1971 e Montemayor, 1974) chegaram a constatar. Inúmeras variáveis, como classe social, perspectiva de sair-se bem ou mal e valores culturais parecem influir em tal atividade. É possivel também que o brinquedo escolhido e utilizado no presente estudo não seja o mais adequado, devido à perspectiva de sucesso e fracasso, para se investigar este aspecto.

Uma sugestão é feita a futuros pesquisadores interessados nesta área de pesquisa que utilizem não apenas um tipo de brinquedo como ocorreu no presente trabalho, mas diferentes tipos de brinquedos e atividades, a fim de verificar se essa relação, rótulo e atração-desempenho, varia de acordo com as características da tarefa.

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RELACION DEL SUICIDIO CON EL TERREMOTO

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Durkeim's theory of the relationship between natural disasters and suicide was explored in relation to the 1972 Earthquake in Managua, Nicaragua. Durkheim hipothesized that suicides would not occur immediately after a disaster, but could be expected to rise in rate later as the socially disintegrative effects of the disaster were felt. This study, although not statistically significant, found that although other forms of emotional distress increased after the Earthquake, suicides did not. Case material of potential suicide victims were studied for the effect of social disintegration. Finally, a slight, but not statistically significant, rise in suicides was demonstrated two years after the Earthquake.

"Según estudios científicos acerca de los comportamientos consecuentes a una tragedia, se puede confirmar el hecho que un desastre puede tener implicaciones psicológicas profundas en las víctimas sobrevivientes" (Fitz 1957). La magnitud de la destrucción, el número de personas muertas y la duración del desastre pueden afectar la intensidad y duración del impacto psicológico. "Algunas manifestaciones pueden ser: aturdimiento, alucinaciones, ilusiones, instinto de huir e instinto de autoconservación, psicología de la multitud, o sea, sentimiento de seguridad en la unión y alta sugestionabilidad" (Megonable 1964).

Las estadísticas generales describiendo la respuesta humana a un desastre indican que un quince a veinticinco por ciento de la población son capaces de dominar su ansiedad, evaluar la situación apropiadamente y tomar pronta y efectiva acción para salvarse a sí mismo o a los demás. Una hora después del impacto, el sesenta por ciento reacciona usualmente de manera adecuada. Cerca de un quince por ciento de la población puede tomar un día o dos para adoptar un comportamiento racional (Tyhurst 1951). Según Miller y Lieberman (1964), los individuos que padecen de disturbios o enfermedades mentales, especialmente los que padecen de depresión, son particularmente vulnerables a las tendencias autodestructivas después de cambios causados por desastres.

Durkheim (1961) fue uno de los primeros en analizar la relación entre el suicidio y los fenómenos sociales y naturales. Según Durkheim cuando ocurren ajustes serios en el orden social, sean causados por una catástrofe repentina o por otro cambio radical, los hombres se inclinan hacia la auto-destrucción. Tomando en cuenta las teorías mencionadas anteriormente, se puede esperar que ocurran situaciones similares a las descritas, después de un desastre de la magnitud del terremoto de Managua, Nicaragua de 1972. Este estudio investigó datos y casos psicológicos dos años después del terremoto. Según Durkheim no debemos esperar la presencia de tendencias auto-destructivas inmediatamente después del desastre, sino varios años más tarde en relación con la desintegración social. Se esperaría que las primeras reacciones ante la crisis fueran: mayor integración social y fuerte tendencia hacia la sobrevivencia inmediatamente después de la tragedia; y posteriormente desintegración social y tendencia hacia la auto-destrucción.

Método

Los métodos de investigación para el presente estudio fueron los siguientes:

(1.) Estudio de las estadísticas antes, inmediatamente después y uno a dos años después del terremoto, para observar si hubo un cambio en la tasa de suicidios. Si la tasa fue muy baja inmediatamente después del terremoto y si después subió en meses y años posteriores, posiblemente se demostraría la teoría antes descrita. (2.) Investigación de casos de las personas que atendieron un centro de crisis y prevención de suicidios durante el mes de enero de 1975, dos años después del terremoto. En estos casos se podría ver el efecto psicológico de desintegración social causado por el desastre.

Resultados y Discusión

Entre las consecuencias del terremoto, se encuentra el surgimiento de una variedad de síntomas psico-patológicos en los damnificados y en los no damnificados (Tabla I).

Lo siguiente demostrará como los síntomas fueron manifestados por las personas estudiadas en el Centro de Crisis, e indica que éstas también estuvieron afectadas psicológicamente por la crisis consecuente al terremoto. Antes del terremoto, estas personas habían expresado sentirse bien, sin problemas psicológicos mayores. Después

Tabla 1
POBLACION ENCUESTADA SEGUN AGRAVACION DE SINTOMAS DE TRASTORNOS DE LA CONDUCTA Y CONDICION DE DAMNIFICADA O NO DAMNIFICADA

	DAMNIFICADA			NO DAMNIFICADA		
SINTOMAS	Total (1)	Con Agravación Número (2)	% (3)	Total (1)	Con Agravación Número (2)	% (3)
Sin síntomas	6,854	2,596	37.3	4,551	708	15.6
Llanto	8,642	1,411	16.3	5,862	333	5.7
Insomnio	8,602	1,994	23.2	5,825	466	8.0
Ansiedad	8,642	1,517	17.6	5,871	386	6.6
Tristeza	8,646	1,965	22.7	5,858	501	8.6
Aislamiento	8,647.	877	10.1	5,855	178	3.0
Negativismo	8,643	710	8.2	5,862	143	2.4
Agitación	8,643	307	3.6	5,867	80	1.4
Irritabilidad	8,561	1,018	11.9	5,809	238	4.1

(1) Número de personas con el síntoma en forma leve o sin él antes del terremoto.

(2) Número de personas que no tenían el síntoma antes del terremoto y ahora lo tienen, más el número de personas que tenían el síntoma leve y se agravó. Se excluyen las personas que para antes y después del sismo declararon el síntoma como leve o como grave (y que por lo tanto no experimentaron variaciones con el sismo).

(3) Porcentaje = (2): (1).

Fuente: Ministerio de Salud Pública, 1974: 52.

del terremoto, manifestaron un cambio de conducta y síntomas depresivos e intentos de suicidio. Estas personas ingresaron voluntariamente al centro. Presentaban los siguientes síntomas:

CASO A. Intranquilidad en el hogar, decaimiento y debilidad. Ganas de gritar. Intento de suicidio tres veces después del terremoto. Siente que le falta cariño y comprensión. Sentimiento de descontrol y de carencia de ánimo. Angustia constante. Siente que su vida "ha sido un calvario." Sentimiento de soledad. La vida no le interesa. La desesperación le causa insomnio. Se siente inmovilizada por su falta de interés en sus actividades diarias. No tiene familia ni amistades a quien recurrir. Su compañero es infiel y no existe comunicación entre los dos.

CASO B: Sentimientos de soledad, angustia y alteración nerviosa. Temor al abandono y a la falta de compañía. Siente que la vida ha sido siempre injusta con ella. Tiene mucha tensión durante el día. Piensa ahorcarse constantemente pues le agobia la soledad en que la dejó el terremoto. Se siente sin ánimos de trabajar (es costurera). Se siente intranquila, "con cara de angustia." Se cree culpable porque siente que su hijo heredará su mismo mal. Se siente inferior. Padece de insomnio. Piensa que es la "persona más desdichada de la tierra."

La calidad y cantidad de síntomas psicológicos presentados por estas personas indican que el terremoto afectó sus vidas considerablemente. A pesar de que tanta gente sufrió problemas emocionales y trastornos de conducta después del terremoto, no hubo una alta incidencia de suicidios inmediatamente después del desastre. Solamente dos suicidios fueron reportados en el periódico "La Prensa" durante los tres primeros meses después de que éste reanudó su circulación.

Las estadísticas de suicidios antes del terremoto indican que la tasa de suicidio se había mantenido relativamente constante, oscilando entre el 0.7 y el 1.3 por ciento, en Nicaragua. En el año 1973 después del terremoto la tasa de suicidios disminuyó levemente. La tasa de suicidio en 1973 fue de aproximadamente 0.8%. (Organización Mundial de la Salud Pública, 1974.) No sólo disminuyó la tasa de suicidio de 1973, sino que también disminuyeron las ideas de suicidio, entre los pacientes del Hospital Psiquiátrico Nacional de Managua.

Juzgando por las estadísticas mencionadas, se puede decir que, aunque después del terremoto aumentó el número de personas con alteraciones y problemas psicológicos, no hubo aumento inmediato en las tasas de suicidios ni hubo aumento en las ideas de suicidio. A medida que pasó el tiempo, se fue incrementando la tasa de suicidios en Managua, poco a poco. Las estadísticas que demuestran ésto son las del diario La Prensa. Los suicidios reportados en este diario durante los últimos tres meses de 1974 demuestran un incremento en la cifra de suicidios, aproximadamente trece por cien mil habitantes. Empleado el "Poisson Distribution" para comparar con la media de suicidio de 1.07 antes del terremoto, se encontró que la probabilidad de que trece suicidios ocurrieran es de 0.386. Aunque esto no sea significativo es interesante.

De los datos extraídos de los casos personales, se pueden resumir las motivaciones de esta gente, que no quiso morir inmediatamente después del desastre, pero que tiene intenciones suicidas recientes. Las personas investigadas en este estudio presentan características típicas de lo que Durkheim calificó como "anomia." Sus motivaciones fueron las siguientes:

CASO A: Ha tenido fuertes decepciones amorosas. Su compañero es infiel y no existe comunicación entre los dos. Siente que no tiene a nadie en su vida. No tiene hijos propios. No se siente bien en su hogar. Su mamá murió en el terremoto. Se siente sola y sin nadie a quien recurrir.

CASO B: Siente que su novio se aprovecha de ella, y que no corresponde a sus sentimientos. Su vida hogareña no es satisfactoria. El trabajo que desempeña no es de su

agrado pues piensa que de no haber sucedido el terremoto, ella tendría un trabajo mejor. No está satisfecha con su vida post-terremoto: el sismo frustró sus proyectos.

De los datos de estos casos se puede apreciar que aún dos años después del terremoto, la gente está todavía inmersa en las consecuencias del desastre, preocupada con los problemas relacionados con la satisfacción de sus necesidades sociales y emocionales.

Los cambios experimentados después del sismo empiezan a cobrar significado patológico en estas personas: el haberse mudado a vivir con un compañero que es infiel, el haberse pasado a vivir a una casa en un vecindario nuevo y en alrededores extraños, el problema de haber perdido su escuela de secretariado a causa del sismo, y la crisis marital desencadenada por la liberalización de morales del marido.

Esto también ilustra la teoría de Durkheim. Según él, la tasa de suicidio varía inversamente al grado de integración de los grupos sociales a los cuales pertenece el individuo. Cuando la sociedad está bien integrada, mantiene a los individuos bajo su control y les prohibe que dispongan voluntariamente de sus propias vidas. Los individuos se aferran a la vida con mayor resolución cuando pertenecen a un grupo. Después del terremoto, la gente se sintió unida en la tragedia. Las familias damnificadas recurrieron a parientes para protegerse y alimentarse. Esta unión de familiares produjo que los damnificados se sintieran integrados en un núcleo social. Cuando la sociedad está muy integrada, hay una protección mayor contra las consecuencias negativas de la crisis, afirma Durkheim. Al sentirse integrados en la sociedad, la gente siente que su egoismo se limita, y que su voluntad de vivir se refuerza. Hay mayor participación en la vida social y hay sentimiento de solidaridad mutua.

Los damnificados sientieron el impacto del sismo con mayor fuerza cuando abandonaron sus lugares de refugio y regresaron a vivir en sus antiguas casas, o en viviendas temporales, o en casas nuevas y desconocidas. La transición repentina causada por la crisis impidió que la sociedad ejerciera su influencia unificadora. Entonces, al tomar lugar ajustes serios en el orden social, la gente se vio inclinada a la auto-destrucción.

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TIPO APERCEPTIVO EN RESPUESTAS DE ANSIEDAD Y HOSTILIDAD

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Esta investigación estudia las características del "tipo aperceptivo" en respuestas que tienen contenido ansiógeno y/u hostil en el Test de las Manchas de Tinta de Holtzman. En una muestra de 100 adolescentes argentinos se observó que, cuando se da la variable Ansiedad hay un aumento de las respuestas globales y cuando se da la variable Hostilidad hay una disminución de las respuestas de Espacio, contrariamente a lo esperado de acuerdo con las hipótesis de Rorschach.

This research studies the characteristics of the "Apperceptive type" in connection with hostile and anxious responses to the Holtzman Inkblot Technique. Against what is expected according to Rorschach's Hypothesis, we found in a sample of 100 argentinian adolescents that when anxiety is involved there is an increment in the number of whole answers and that when hostility is involved, there is a decrement in the number of space answers.

Desde los primeros trabajos de Rorschach sobre su test de manchas se ha reconocido la importancia diagnóstica del modo en que el sujeto parcializa la mancha para dar su respuesta, es decir, si usa toda la mancha, una parte de la misma o el espacio blanco.

Esta modalidad perceptiva, denominada por Rorschach (1972) "tipo aperceptivo", y por Klopfer (1954) "tipo de enfoque", depende tanto de los rasgos de personalidad del sujeto como de las características estructurales de las láminas y de las circunstancias de la prueba (situación de test, personalidad del examinador, etc).

El objetivo de esta investigación es analizar las características del "tipo aperceptivo" en respuestas que tienen contenido ansiógeno y/u hostil en el Test de las Manchas de Tinta de Holtzman (HIT) (1971). En un trabajo anterior (Sacchi, 1974) se observó que, en las respuestas que tenían puntaje en la variable Ansiedad había mayor porcentaje de respuestas globales y en las que tenían puntaje en la variable Hostilidad había menor porcentaje de detalle blanco, contrariamente a lo esperado en Rorschach donde se supone que en personalidades ansiosas aumenta la parcialización de las láminas, y por lo tanto las respuestas de detalle pequeño, y en personalidades agresivas y oposicionistas aumenta el número de respuestas de inversión figura-fondo, es decir de espacio blanco.

En el trabajo original de Holtzman el puntaje final en la variable Localización no aparece discriminado, sino que es un valor único que resulta de la suma de los puntajes 0 para las respuestas globales, 1 para las de detalle grande y 2 para las de detalle pequeño.

En este estudio, por el contrario, el puntaje en Localización será diferenciado según sus tres categorías para luego poder comparar la proporción de globales, de detalle grande y de detalle pequeño en tres tipos de respuestas: aquéllas que tenían puntaje en la variable Ansiedad, aquéllas que tenían puntaje en la variable Hostilidad y aquéllas que tenían puntaje en ambas variables.

La muestra utilizada estaba constituída por 100 sujetos varones, de 18 años de edad, alumnos de una escuela técnica. El HIT fue administrado en forma colectiva.

Las respuestas que presentaban puntaje en la variable Ansiedad, en la variable Hostilidad o en ambas, fueron analizadas desde el punto de vista de la Localización, discriminando el puntaje total obtenido en esa variable en sus diferentes categorías, y agregando el puntaje de la variable Espacio (E).

Se obtuvo así un puntaje total en las categorías global (W), detalle usual grande (D), detalle usual pequeño (d), y espacio blanco (de). Se consideró además la categoría detalle raro (dr) en la que se incluyeron todas aquellas localizaciones, sean D ó d que no se hallan citadas en el Apéndice A del HIT (1), y que, por lo tanto, no serían consideradas frecuentes por Holtzman.

Resultados

De un total de 4.500 respuestas, 254 presentaban puntaje en la variable Ansiedad, 287 en la variable Hostilidad y 421 en ambas variables.

En la Tabla 1 observamos los porcentajes correspondientes a cada categoría de Localización en respuestas que tienen puntaje en Ansiedad, en Hostilidad y en ambas variables.

Tabla 1

PORCENTAJES DE CADA CATEGORIA DE LOCALIZACION

	W	D	d	de	dr
(1) Ansiedad	42	16	35	4	3
(2) Hostilidad	16	24	47	3	9
(3) Ansiedad y Hostilidad	38	27	28	.7	6
(4) Ansiedad y Hostilidad + Ansiedad	39	23	30	2	5
(5) Ansiedad y Hostilidad + Hostilidad	29	26	35	.2	8

Comparando los porcentajes de las respuestas que tienen puntaje en Ansiedad solamente, (hilera 1) con las que tienen puntaje en Hostilidad solamente (hilera 2), encontramos que en las segundas hay un porcentaje menor de W, levemente mayor de D, y mayor de d y dr, permaneciendo semejante el de "de".

Comparando los porcentajes de las respuestas que tienen puntaje en Ansiedad solamente (hilera 1), con las que tienen en Ansiedad y en Hostilidad (hilera 3), hallamos que en estas últimas disminuye levemente W, aumentan D y dr y disminuyen d y "de".

Comparando los porcentajes de las respuestas que tienen puntaje en Ansiedad solamente (hilera 1) con aquéllas que tienen en Ansiedad y Hostilidad sumadas a las que tienen Hostilidad solamente (hilera 5) hallamos que en las segundas disminuye el porcentaje de W y "de", aumenta el de D y dr, permaneciendo igual d.

Comparando los porcentajes de las respuestas que tienen Hostilidad solamente (hilera 2) con las que tienen Ansiedad y Hostilidad (hilera 3), hallamos que en estas últimas se encuentra aumentado el porcentaje de W, disminuído el de d y dr, permaneciendo semejante D y "de".

Comparando los porcentajes de las respuestas que tienen puntaje en Hostilidad solamente (hilera 2) con las que tienen puntaje en Ansiedad y Hostilidad sumadas a las que tienen Ansiedad solamente (hilera 4), hallamos que en estas últimas hay un

aumento de las W, una disminución de d y dr, permaneciendo los valores de D y "de" semejantes.

Nótese que, cuando se da la variable Ansiedad, sea sola, sea junto con Hostilidad, hay un aumento de W y "de", y una disminución de D, d y dr.

Discusión

En los tests de personalidad basados en manchas de tinta se supone que las diferencias en el "tipo aperceptivo" se deben a características de la personalidad y se espera que, en sujetos ansiosos, aumente la parcialización de las manchas y por lo tanto aumenten las respuestas de detalle y disminuyan las globales, y que, en personalidades oposicionistas y agresivas, aumente el número de respuestas de espacio banco.

Analizando los datos obtenidos en nuestra muestra hallamos que, contrariamente a lo esperado, cuando se da la variable Ansiedad, hay un aumento de las respuestas globales en detrimento de las de detalle, y cuando se da la variable Hostilidad, hay una disminución de las respuestas de espacio blanco.

Debe tenerse en cuenta que las hipótesis precedentes son derivadas del test de Rorschach, donde no sólo las láminas son diferentes sino también la consigna. En Rorschach, el sujeto es libre de dar cuantas respuestas quiera en cada lámina, en cambio en Holtzman se le indica expresamente dar una sola respuesta por lámina. Esta característica de la consigna podría llevar a sujetos moderadamente ansiosos a dar respuestas que integran los detalles en una totalidad, es decir, a no dejar escapar nada en su intento por dar buenas respuestas, controlando la situación en todos sus elementos.

Cuando se da puntaje solamente en la variable Hostilidad, habría una perturbación perceptual producida por ese tipo de contenido, disminuyendo el número de respuestas globales y aumentando las de detalle raro.

Cuando además del puntaje en Hostilidad, hay también puntaje en Ansiedad, la perturbación sería menor, permaneciendo más o menos constante el porcentaje de globales.

Es decir que, en situaciones de tensión, sería suficiente mecanismo de defensa la proyección de sentimientos ansiógenos en la verbalización del contenido de las respuestas; cuando, en cambio, los contenidos proyectados son hostiles y no interviene la ansiedad "moderadora", la perturbación producida por el conflicto perdura, apareciendo el trastorno en el área perceptiva, disminuyendo la capacidad de organización y el nivel de aspiración.

En lo que se refiere a la disminución de las respuestas de espacio, cuando se da la variable Hostilidad, se podría deber al hecho que los espacios blancos son cualitativamente diferentes en Rorschach y en Holtzman, donde a veces asumen cualidades formales bien definidas. Debemos también tener en cuenta que E es una variable bastante asimétrica para Holtzman.

Por otra parte, hay dos corrientes diferenciadas en cuanto a la significación de "de": una derivada directamente de Rorschach (1972), en que se le asigna a esas respuestas el sentido de tendencias oposicionistas, Rapaport (1946), Beck (1952), Stein (1954), debido a que se pide al sujeto interpretar lo que aparece en la lámina (figura) y no lo que no aparece (fondo).

La otra corriente de autores, Klopfer (1954), Bandura (1954), Piotrowski (1957), Fonda (1960) considera el rasgo de oposicionismo como un rasgo positivo, autoprotectivo, es decir que al hacer la inversión figura-fondo, el sujeto utilizaría en modo adaptativo la tensión producida por la tarea o por el contenido proyectado en la lámina.

Nuestros hallazgos serían concordantes con esta segunda corriente, por cuanto al darse un alto puntaje en Ansiedad, aumenta el porcentaje de respuestas de espacio blanco, y al darse puntaje sólo en Hostilidad, ese porcentaje disminuye.

Por otra parte, no debemos desconocer el carácter orgánico que poseen los tests de personalidad basados en manchas de tinta, donde cada elemento tiene significado en relación y combinación con los demás.

Por ejemplo, en nuestro caso ¿cómo son las W dadas en los tres tipos de respuestas: primarias y simples o secundarias y combinadas? La forma de esas respuestas ¿cómoes: vaga e imprecisa o específica y organizada? ¿qué grado de organización tienen las respuestas? ¿qué proporción de movimiento tienen? ¿qué proporción de color? ¿qué proporción de otros factores perturban estas respuestas (Barrera, Penetración, Contenido, Verbalización patológica, etc.)? ¿cómo se dan estos fenómenos en las restantes respuestas dadas por un mismo sujeto, es decir, aquéllas que no tienen puntaje en Ansiedad y Hostilidad?

Todos estos interrogantes pueden ser motivo de investigaciones posteriores, tendientes a aclarar mejor la legitimidad del uso de hipótesis derivadas del test de Rorschach en los puntajes obtenidos en el HIT.

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NEW DEVELOPMENTS REGARDING CONTENT THEORIES OF JOB ATTITUDES AND MOTIVATION

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Content theories are those which place primary emphasis on particular attitudes or motives. Although process aspects are often included, these theories are distinguished by the fact that process considerations are distinctly secondary, or have appeared subsequent to the original formulation (Miner & Dachler, 1973). I will attempt to assess the current status of a number of these theories, including need hierarchy or self-actualization theory (Maslow, 1970), two-factor theory (Herzberg, 1966), job enlargement theory (Ford, 1969), achievement motivation theory (McClelland, 1961), and managerial role-motivation theory (Miner, 1965).

Research evidence bearing on need hierarchy theory indicates that either the theory is not supported, or that it has not been formulated precisely enough to permit adequate testing. Yet the theory has proved to have major side benefits in the very sizable amount of research it has generated bearing on differences between cultures, occupations, and types of organizations. Several recent attempts to modify need hierarchy theory to make it more consistent with the evidence appear promising, but data to permit any final assessments are lacking. Among the most promising of these modified theories are those of Alderfer (1972) and Wolf (1970).

In support of what I have said regarding need hierarchy theory let me paraphrase a recent, and yet unpublished, review of the related research by Wahba (in press). He says The theory has received little clear or consistent support from the available research findings. Some of Maslow's propositions are totally rejected, while others receive mixed and questionable support at best. The validity of the need classification scheme is not established, although deficiency and growth needs may form some kind of hierarchy. There is no real evidence to support the deprivation — domination proposition with regard to need succession and importance, except with regard to self-actualization. Yet self-actualization may very well be based more on wishes for what man should be than on what he actually is. Accordingly, its status as a basic need can be seriously questioned.

Wahba continues — Longitudinal data do not support Maslow's propositions, and the limited support received from cross-sectional studies is questionable due to numerous measurement and control problems. All in all Wahba is not very encouraging regarding the need hierarchy theory, although he does recognize the potential value of reformulations, such as that of Alderfer.

Two-factor theory as proposed by Herzberg has generated much controversy. In general, it has not fared well at the hands of the researchers. Early findings supporting the theory now appear to be a consequence of subject defensiveness, rather than motivator-hygience differences, and the discontinuity hypothesis regarding satisfaction-dissatisfaction has not been confirmed. Yet as with need hierarchy theory, recent reformulations of two-factor theory, especially as related to the differential importance of intrinsic and extrinsic motives in different contexts, do offer some prospects of yielding fruitful results. In particular I have in mind here the views of Soliman (1970) and Wernimont (1972).

In general, I agree with the conclusions reached by Locke (in press). He says — One is ultimately forced to the conclusion that a double standard is being used by supporters

of the theory in evaluating the evidence, based on the a priori assumption that the Motivator-Hygiene theory is valid. The idea of two unipolar continua, one pertaining only to dissatisfaction and involving Hygiene and the other pertaining only to satisfaction and involving Motivators, seems indefensible, both logically and empirically. Also, the treatment of supervisory practices as Hygiene elements is entirely spurious. The same conclusion appears applicable to the classification of pay. Although Locke is very hard on two-factor theory, his conclusions regarding the Herzberg version do appear to square with the evidence.

Job enlargement has emerged as a major area of applied endeavor in the United States. As the amount of experience and research has grown, it has become increasingly apparent however, that the effectiveness of the approach is strongly conditioned by the nature of the individual to whom it is applied. Theoretical extensions designed to encompass this variable are now beginning to appear and the stress is shifting from job enlargement and enrichment to job size and change. The close relationship between theory and practice makes this work appear particularly promising.

Although the job enlargement approach received considerable impetus from two-factor theory, it has other roots as well. This fact has made it difficult to identify a clear theoretical base and has confounded the interpretation of research findings. Locke (1975) has identified 13 entirely distinct personnel practice changes that have been introduced under the guise of job enlargement or enrichment. When such practices produce changes in performance and satisfaction it is often very difficult to relate the changes to a theory of enrichment. There is a great need to identify the particular elements of the approach and to determine their relative effectiveness in producing high morale and productivity. There is a real risk that job enlargement-enrichment may become synonymous with only personnel practice change. At that point the theoretical strength of the concept will be lost.

Achievement motivation theory is increasingly emerging as primarily an occupation specific, limited domain theory of entrepreneurship, although this was not McClelland's original intent for his theory. Within this entrepreneurial domain the theory has received strong support; outside the domain studies offer little support. In addition efforts to integrate the theory with attribution theory and expectancy considerations have provided a greater understanding of the dynamics of achievement motivation. At present the major area where work is needed is operationalization and measurement.

Further evidence of the value of this limited domain approach, as distinct from grand theory as represented by VIE and need hierarchy theory, is provided by my managerial role-motivation theory. This theory has proved effective in predicting managerial success in hierarchic organizations, although not in predicting leadership success generally (Miner, Rizzo, Harlow, and Hill, 1974). It is unrelated to managing professional organizations and to emergent leadership in small groups, for instance. The theory has also contributed to the formulation of management development programs, to an understanding of career choices, and to the development of guidelines for managerial manpower planning (Miner, 1973; 1974).

The success of limited domain theories in such areas as entrepreneurship and the management of bureaucracies suggests that this approach should be extended to the development of motivational theories for other major occupational groups and aspects of work behavior. The societally significant and pervasive groups and aspects should be given attention first. Subsequently through a comparative analysis of these sub-theories a more comprehensive theory of job attitudes and motivation might be generated. Such a primarily inductive strategy appears promising at least-as a supplement to and perhaps as a replacement for the essentially deductive theoretical strategy that is now so much in vogue.

But even without such a comprehensive synthesis, effective limited domain theories of motivation can have great practical value. This is because they tend to focus on pragmatic questions-such as the following:

1. Does the theory predict job performance within the domain as hypothesized — the validity problem?
2. How and to what extent can the motivational processes of the theory be influenced — the training and development problem?
3. Are the motivational processes of the theory involved in vocational and organizational choice — the vocational guidance problem?
4. Does the theory predict work satisfaction within the domain — the job satisfaction problem?
5. What is the supply of the type of motives posited by the theory in the population and in relevant subgroups — the talent supply problem?
6. What methods of measurement are available to measure the constructs of the theory — the measurement problem?
7. What are the true limits of the theory's domain and how does it overlap other domains — the domain definition problem?
8. What is the basic underlying nature of the constructs of the theory — the construct validity problem?

Let me end with a few summary statements regarding content theories of motivation:

1. Content theories have generated a great deal of research recently, although this research tends to be somewhat fragmented.
2. There is a clear movement recently toward integration of theories, although not necessarily of research.
3. It is becoming increasingly evident that motivational theories must be concerned with the organizational contexts in which manifestations occur.
4. In my opinion the most fruitful recent development is the emergence of limited domain theories which focus on certain strictly limited occupational roles and their motivational requirements.

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REASONING

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Reasoning is typically defined as the drawing of inferences or conclusions from known or assumed facts, with formal logic defined as the science (or art) of correct reasoning. Thus, formal logic can be viewed as a standard, that is, how one ought to draw conclusions. It is by now widely accepted that formal logic is frequently not a very good description of how people actually draw conclusions. In this paper, we shall explore the manner in which people perform tasks defined in terms of formal logic. Attention will be directed toward two different reasoning tasks. The first, employing the classical syllogism, presents the person with a set of categorical propositions each of which relates two terms; assuming these propositions to be correct, the person's task is to determine what further proposition, if any, must be correct. The other task employs hypothetical propositions of the conditional or "if. . ., then. . ." form, with the person's task being to determine how the truth or falsity of the proposition should be tested. In addition to describing some psychological research employing these tasks, I shall offer some speculations about the meaning of the findings for reasoning in other situations, particularly for the scientific enterprise.

Syllogistic Reasoning

The standard syllogism consists of two premises which are assumed to be true. A conclusion can also be presented, in which case the task is to decide if the conclusion follows necessarily from the premises. Alternatively, the person can be asked to choose

Table 1
SET RELATIONS LOGICALLY IMPLIED BY CATEGORICAL PROPOSITIONS

All A are B				
Some A are B				
No A are B				
Some A are not B				

the conclusion, if any, which follows necessarily from the premises. To state this somewhat more explicitly, the syllogisms forming the basis of this discussion can be described as follows: One premise relates the terms A and B, while the other premise relates the terms B and C; any conclusion, valid or invalid, relates the terms A and C.

Four types of propositions can be used, as indicated in Table 1. Depending on the type of proposition and the order of the terms in the premises, syllogisms can be described as valid, meaning that one or more propositions relating A and C necessarily follow, or invalid, meaning that no specific proposition necessarily follows. Note that, in the syllogisms I shall describe, while the order of the terms in the premises may vary, the conclusions always involve the A term as subject and the C term as predicate. This is not necessary but rather for convenience.

With respect to the manner in which people draw conclusions from syllogisms, there are three kinds of theories which have been proposed. One of these is logic itself, another is the atmosphere hypothesis, which is in effect a proposal that people perform the task in an alogical fashion, and the third I shall call "partial computation models", the gist of which is the notion that people attempt to process the syllogism in accordance with the rules of logic but fail to do so completely. Let us consider these in turn.

Formal logic specifies the meanings of the propositions and the rules under which premises may be combined to yield a valid conclusion. Each premise can be interpreted in terms of the relationships it establishes between the set of things called A and the set of things called B (for an A-B premise). In Table 1, it can be seen that three of the four proposition types are ambiguous in the sense that the proposition is consistent with two or more set relations. It is also worth noting at this point that, in logic, the term "some" has a meaning quite different from its meaning in ordinary discourse. Specifically, "some" means "at least one and perhaps all". The important implication is that to state "Some A are B" is consistent (allowable in logic) with a set relation between A and B which can also be described by "Al A are B", and that to state "Some A are B" does not in logic necessarily mean that "Some A are not B". In ordinary discourse, one would not typically state "Some A are B" unless one also meant to imply that "Some A are not B". Consequently, we can expect that people will have difficulty conforming to the rules of logic when dealing with premises containing "some", but not for a particularly interesting reason. However, I would point out that there is the suggestion in the research findings that telling people about the special meaning of "some" in logic does not appear to aid them in performing logically on syllogisms.

According to logic, to process a syllogism one must consider each premise in *all* of its possible meanings. Furthermore, one must consider all possible combinations of the set-relation meanings of the premises, and the rule is that a conclusion is valid only if it

Table 2
LOGICAL ANALYSIS OF A SYLLOGISM

Premises	Set-relations		Possible Combinations		Conclusion
All A are B					All A are C
All B are C					

describes all of the combinations generated. Thus it can be seen that even the relatively simple syllogism illustrated in Table 2 is fairly complicated. I wish to emphasize the fact that the logical person is one who considers all the possibilities, with respect to the meanings of the premises, the combinations of set relations generated from the premises, and the rule for selecting a conclusion.

At the opposite extreme from this logical view of the reasoner is the characterization implied by the atmosphere hypothesis. As initially proposed by Woodworth and Sells (1935), the hypothesis is that the nature of the premises (eg., negative, particular) determines the kind of (erroneous) conclusion which people will accept. Begg and Denny (1969) have stated the atmosphere hypothesis in terms of two principles: 1. If one or more of the premises is negative, then a negative conclusion will be accepted. 2. If one or more of the premises is particular, then a particular conclusion will be accepted. Implicit in their proposal is a default option, that is, if no premise is negative, and if no premise is particular, then a universal affirmative conclusion (All A are C) will be accepted. The application of this system to any syllogism yields a prediction of the specific conclusion which will be accepted. For example, for the premises "No A are B" and "Some B are C", the prediction is that the conclusion "Some A are not B" will be accepted (in this case, it is invalid).

In its weakest form, the atmosphere hypothesis is merely a means of predicting the most popular error for the cases in which people erroneously accept invalid conclusions. In a number of studies, analyses of conclusions erroneously accepted have been reasonably consistent with atmosphere predictions. However, in my judgment, the hypothesis in this weak form is of very little value. It requires ignoring correct responses of accepting valid conclusions and correct responses of "Can't conclude anything" for invalid syllogisms. Furthermore, it contains no principles by which one may predict when atmosphere principles will apply (one must simply wait for a person to accept an invalid conclusion). Consequently, I prefer to deal with the atmosphere hypothesis in its strong form. As a strong statement, the atmosphere hypothesis postulates that people draw conclusions from premises without processing the propositions but rather, in effect, by responding to the adjectives which the propositions contain. It implies no distinction between valid and invalid syllogisms, and it cannot predict that a person will ever choose to respond "can't say". In fact, one can find at least some data consistent with the strong form of the hypothesis. However, as will be seen shortly, such data are consistent with another explanation.

Table 3
ASSUMED PREMISE (MIS) INTERPRETATIONS

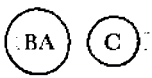
All A are B	
Some A are B	
No A are B	
Some A are not B	

Partial computation models hold that people attempt to process syllogisms logically, but that they fail to consider all the possible meanings (in set-relation terms) of premises and fail to compute all possible combinations of premises (again, in set-relation terms). Although less attention has been directed toward the final step, such models may also include the notion that people might adopt a conclusion if it applies to most (but not all) of the combinations they have generated (I simply mention this possibility and will have relatively little to say about it further). Several versions of such a theory have been proposed (eg., Chapman & Chapman, 1959; Erickson, 1974), but I shall describe for you the version favored by Ceraso and Provitera (1971).

According to this model, people are assumed to misinterpret the premises of a syllogism, as indicated in Table 3. Note that propositions of the form "No A are B" refer to only one relation, that of nonoverlapping sets, and thus are not misinterpreted. Having interpreted the premises incorrectly, people are assumed to then combine them appropriately, but the data indicate that people do not always generate all possible combinations of the misinterpreted premises. The overall picture is of a person who is a less-than-perfect information processor, a characterization for which there is a great deal of supporting evidence.

The difficulty in distinguishing a partial computation model from the atmosphere hypothesis is that, for many syllogisms, the two positions make exactly the same predictions. Consider the syllogism in Table 4. The atmosphere hypothesis predicts that people will accept the conclusion "No A are C" because the premises create an atmosphere for a universal negative conclusion. The partial computation model predicts the same response on the assumption that people will interpret the premise "All B are A" to mean "All B are A and all A are B". It can be seen that, given this interpretation, the conclusion does necessarily follow from the premises. Despite the fact that atmosphere and partial computation notions frequently lead to the same predictions, recent research has yielded findings favoring the partial computation approach.

Table 4
PARTIAL COMPUTATION REASONING

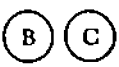
Premises	Meanings	Combination	Conclusion
All B are A			No A are C
No B are C			

Ceraso and Provitera (1971) tested the hypothesis that, if people are given unambiguous premises which lead to a valid conclusion, they will perfom much better than when given ordinary premises. Premises were made unambiguous by increasing their lenght and specifying only one set relation. For example, in place of the ordinary premise "All A are B", one would use "All A are B, but there are some Bs which are not A", thus specifiying that the set A is included within the larger set B. The results indicated that people made very few errors when given syllogisms containing such

modified premises. Furthermore, it was demonstrated that subjects' responses to modified syllogisms could be used to predict subjects' responses to ordinary syllogisms, supporting the thesis that, given ordinary syllogisms, people tend to misinterpret the premises in the ways indicated in Table 3 but then combine them logically. Thus, the partial computation model provides a way of understanding both the largely correct performance of subjects given modified syllogisms and the kinds of errors people make on ordinary syllogisms.

There are syllogisms containing only unambiguous premises for which subjects' accuracy is considerably poorer. The characteristic of these syllogisms is that multiple and contradictory A-C relations are possible. For example, consider the syllogism in Table 5, which contains only unambiguous premises. It can be seen that these premises can be combined in several ways, and that no conclusion applies to all the possibilities, thus the correct response is "can't say". The point is that if a person generates only one of these combinations, he might then accept an invalid conclusion because it applies to the combination he has generated. For such syllogisms, the correct response of "can't say" is given by many subjects, but there is also a considerable number of acceptances of invalid conclusions. This had led to the inclusion in the model of the notion that people do not always compute all the possibilities.

Table 5
A SYLLOGISM FOR WHICH INCOMPLETE COMPUTATION LEADS TO ERRORS

Premises	Meanings	Possible Combinations and Conclusions	
No A are B			No A are C
			All (some) A are C
No B are C			Some A are C Some A are not C

Note. Although the premises are unambiguous, no logical conclusion is possible if all possible combinations are considered.

Using a different methodology, Revlis (1973) has also obtained evidence supporting the idea that people tend to be imperfect logicians. Premises containing meaningful terms were used, with the terms in different premises chosen to suggest specific set relations. Thus, in one syllogism containing a premise of the form "All A are B", the terms would be selected to suggest that A and B are one and the same set, while in another syllogism, a premise of the same form would suggest that A is a subset of B on the basis of the terms used. Revlis demonstrated that people's performance on syllogisms was dependent on the kinds of set relations suggested by the terms in the premises, a finding consistent with the idea that people misinterpret premises but combine them appropriately. The finding that the nature of the terms is important is inconsistent with the atmosphere hypothesis.

Recently, we tried a different approach to the question of deciding among theories. The attempt was made to subdivide the group of subjects into those best described as

logical, those conforming to a partial computation model, and those appearing to follow the atmosphere hypothesis. The outcome of this preliminary study is depicted in Table 6, where it can be seen that the partial computation model is the best description of the majority of people. Let me describe how this was done. Stage 1 employed syllogisms for which all three notions, logic, atmosphere, and partial computation lead to the same predicted conclusion. The outcome of this stage was the identification of 10 subjects who failed to give the predicted response sufficiently often; all that can be said about these people is that we are not sure how they do syllogisms. Stage 2 employed syllogisms for which logic disagrees with atmosphere and partial computation predictions, the latter two predicting the same (now erroneous) conclusion. Here, the outcome was the identification of 8 subjects who seem best described as logical, with the remaining 52 subjects giving the vast majority of their responses in accordance with atmosphere = partial computation predictions. In Stage 3, the attempt was made to separate atmosphere from partial computation predictions, using syllogisms for which the atmosphere hypothesis predicts the acceptance of a specific conclusion, whereas the partial computation model predicts some distribution of responses among various alternatives including the correct answer of "can't say" (all of these syllogisms are logically invalid), as well as the conclusion predicted by atmosphere considerations. Consequently, this analysis is relatively weak. The 5 subjects identified as "atmosphere" accepted the conclusion predicted by the atmosphere hypothesis for all 4 syllogisms used in Stage 3, whereas what can safely be said about the 47 subjects labeled "partial computation" is that they deviated from atmosphere predictions one or more times. While recognizing that the Stage 3 separation involves some difficulties, the analysis does suggest that only a very small percentage of subjects (at best) conform to atmosphere predictions.

Table 6
SEPARATION OF SUBJECTS INTO TYPES OF REASONERS
INITIAL NUMBER OF SUBJECTS = 70

Stage 1	Logic or Atmosphere or Partial Computation n = 60		Other n = 10
Stage 2	Logic n = 8	Atmosphere or Partial Computation n = 52	
Stage 3		Atmosphere n = 5	Partial Computation n = 47

Quite clearly, results such as those just described are limited in generality. It seems obvious that if syllogisms were given to people who had just completed a course in logic, the results would be very different. Among our subjects, the very small number who indicate that they have had formal training in logic tend to perform logically (though not all, and not without errors). The limited meaning of the results is that, among a group of college students who have not had formal training in logic, the majority seem describable as tending to misinterpret premises and failing to consider all possible combinations of premises.

That this should be the case seems readily understandable. As mentioned earlier, there is an abundance of evidence indicating that people are less-than-perfect processors of information in a wide variety of situations. Furthermore, the propositions encountered in everyday discourse are typically unambiguous, in contrast to premises containing abstract terms like A and B. For example, it is very unlikely that anyone would interpret the statement "all cats are animals" as implying that "All animals are cats". However, I do not wish to give the impression that people will perform better on syllogisms with meaningful premises than on syllogisms containing abstract terms; indeed, I wish to stress that such an impression is false. The fact that meaningful propositions tend to be unambiguous, referring to only one set relation, is likely to be generally helpful because the task is simplified. However, the use of meaningful propositions also introduces an additional influence on subjects' behavior, namely the issue of factual accuracy. This can lead to what Henle (1962) has termed "failure to accept the logical task", which means evaluating conclusions in terms of whether or not they are factually correct, not in terms of whether or not they follow from the premises. As Revlis (1973) has shown, the use of meaningful propositions can lead to performance which is either better or worse than performance on abstract syllogisms, depending on the choice of meaningful propositions.

Let me now offer a speculation. In thinking about how people perform on syllogisms, it occurred to me that an analog of the partial computation model seems to apply to the process of evaluating research (at least the kinds of research found in psychology). One facet of the partial computation model is that people will tend to accept invalid conclusions because they fail to realize that the premises can also lead to another, incompatible conclusion. The analog is that, all too frequently in psychological research, an investigator will accept a conclusion only to find out later, usually when his paper is rejected for publication, that his data are also consistent with another, incompatible conclusion. Quite commonly, a professor will chastise a student for failing to see that the conclusion he read in an article does not necessarily follow from the research (that such studies appear in print suggests that even journal editors sometimes fail to consider all the possibilities).

It is intriguing to consider why people stop short of full computation. One possible reason has already been implied. For syllogisms containing meaningful propositions, a person might cease processing when he reaches a conclusion which is factually correct. This can be considered as a special case (in which there is consensual agreement about what is factually correct) of a person considering the problem solved when he reaches a conclusion consistent with his beliefs. In the analogous case, since a researcher typically begins an investigation hoping to reach some particular conclusion, one can imagine that obtaining results consistent with that desired conclusion might "blind" him with respect to other conclusions. However, the notion of preexisting biases for a particular conclusion seems likely to be at best a partial explanation because similar behavior (accepting a conclusion when one shouldn't) occurs with abstract syllogisms, for which it is difficult to argue that people have pre-existing biases. Similary, it does not seem likely that a person reading a journal article begins with a bias in favor of the author's stated conclusion. This suggests the need to search for some more general explanation not tied to biases for particular conclusions. Indeed, such a suggestion has been made by the British psychologist Peter Wason, who has proposed that people have a strong tendency to seek to confirm propositions but have very little interest in seeking to falsify them.

The basis of Wason's suggestion is a series of studies in which people are required to indicate how they would test a proposition of the form, "If p, then q". The truth table for such a proposition is such that the proposition is falsified only by the occurrence of a "p-

not q" instance. Instances of "pq" confirm the proposition, while "not p-q" and "not p-not q" instances are "confirming" under a two-state logic, irrelevant under a three-state logic. The gist of Wason's remarks is that people fail to see the importance of falsifying instances; rather, their tendency is to cumulate confirming instances.

Table 7
MATERIALS USED IN TESTS OF PROPOSITIONAL LOGIC

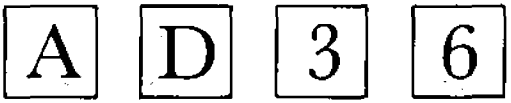


Table 7 contains exemplary materials which can be used to illustrate the task which subjects are given. Assume that the four boxes in Table 7 are 4 cards lying on a table. People are told that each card has a letter on one side and a number on the other; thus, each of the cards showing a letter has some number on the other side, while each card showing a number has some letter on the other side. Subjects are then given a rule which applies to the cards, for example, "If a card has a vowel on one side, then it has an even number on the other side". Thus, the implication is that vowel implies even number. The task is to indicate which cards one would need to turn over in order to determine if the stated rule is true or false. The essential finding is that very few subjects make the correct choice of indicating that both the card showing "A" and the card showing "3" should be turned over; roughly 10% of subjects make this choice. Many more subjects (ca. 40%) indicate that they would test the cards showing "A" and "6" respectively, while approximately 30% state that they need to turn over only the card showing "A".

Overall, the most salient feature of the results is the failure of subjects to test the card showing "3". Note that this card corresponds to "not q" and should be examined because, if it also contains "p" (in this example, a vowel), the rule would be false. Thus, this instance can serve only to falsify the rule, and it is this instance which the vast majority of subjects fail to test.

Wason (Johnson-Laird & Wason, 1970) describes people as having either no insight, partial insight, or complete insight into the importance of seeking to falsify a proposition. The person with no insight seeks only to confirm the rule, thus selecting the cards with "A" and "6" because each could provide a confirmation. The person with partial insight chooses to test the "A" card only, realizing that, if it should have an even number it would confirm the rule, but also realizing that, if it should have an odd number it would falsity the rule. Only the person with complete insight recognizes the importance of testing the card which can only possibly falsify the rule ("3").

Using a different task, Wason (1960) has observed a similar tendency to seek confirmation of hypothetical propositions. In this task, subjects are told that the series "2, 4, 6" conforms to a simple rule which they are to discover by generatin successive series of their own. After each series, the person is told only whether or not the generated series conforms to the (experimenter's) rule, which happens to be "numbers increasing order of magnitude". It can readily be seen that the series "2, 4, 6" is consistent with a number of rules which are more specific than "numbers in increasing order of magnitude". The essential finding is that, when a person has formulated a more specific rule, eg., "number increasing by 2", he almost always seeks to test it by generating a sequence which is consistent with his hypothesis (eg., by generating 8, 10, 12). This

behavior can lead, in principle, to an infinite number of confirmations of the subject's limited rule, thus resulting in his never discovering the more general rule. Wason has argued that what the subject should do, if his hypothesis is "numbers increasing by 2", is to generate a series inconsistent with his rule (eg., 4, 7, 10); only by learning that this series *does* conform to the experimenter's rule can the person discover that his hypothesis is wrong and that he must seek a different rule.

Not surprisingly, Wason's research has elicited strong criticism. Let it suffice to say that his data are replicable; however, his interpretation of the data has been challenged (eg., Wetherick, 1970). The argument against Wason goes as follows. People must consider Wason's tasks as "mental puzzles" or "laboratory games" in order to respond in the way that Wason calls correct. Conversely, if people consider his tasks as representative of proposition testing in everyday life or science, then they are quite correct in behaving as they do. The argument is that the goal of ordinary living or scientific activity is to identify propositions that are true, that it would be foolish to spend one's time seeking only to falsify propositions because an infinite number of idiotic propositions could be formulated, and, having falsified a great number of them, one would still know very little. To argue that searching for true propositions is appropriate is not to deny that such propositions ought to be potentially falsifiable, but it does argue that seeking primarily to falsify is not a sensible procedure.

The argument continues with the characterization of meaningful hipothetical propositions. If the consequent "q" occurs very widely, there is likely to be little interest in indentifying "p's" from which q is implicated. Thus, it is likely to be the case that "not q" occurs more frequently than "q". Furthermore, for a proposition "If p, then q" to be even worthy of consideration, p cannot occur more frequently than q. According to the principle of multiple causation, it is unlikely that p is the only antecedent of q, rather, it is to be expected that q occurs more frequently than p. Finally, if the proposition is "sensible", it seems likely that at least some p's are q's (i. e., some observations of pq have already been made). The result is that the space of possible outcomes with respect to "If p, then q" is as follows (Fig. 1): A very large part of the space is filled with outcomes of "not-p, not-q"; q is a relatively small set in the space, and p is smaller still; in addition, p is likely to be at least partly contained in q the question is whether or not p is completely *within* q. It can be seen that in such a space, the strategy of finding not-q's and checking them to see if any is p would be at least extremely inefficient. The critics argue that it is precisely this generally inappropriate strategy which Wason requieres subjects to follow in order to be viewed as reasoning correctly in his proposition-testing task. While this criticism has some merit, it does not seem sufficiently compelling that one should completely reject Wason's interpretation of his findings; at this point, the best decision is probably to withhold judgment.

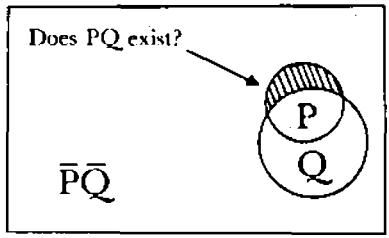


Figure 1. The probable event space related to a plausible proposition of the form "If P then Q".

Let me summarize these observations. Intelligent people who have not had formal training in the logic defining correct behavior in a reasoning task frequently do not conform to logical rules (though we must recognize that "what is correct" is sometimes debatable). Such people tend to view some propositions as less ambiguous than they are, to fail to consider all the possible conclussions which an argument allows, to have their judgements of internal consistency influenced by considerations of factual accuracy and by prior beliefs, and appear to underestimate the importance of falsifying evidence. However, it is obvious that these are not immutable characteristics of human reasoning. Some people know and use formal logical principles in drawing conclusions, and presumably anyone could acquire such knowledge if this were deemed a desirable goal and appropriate instructional steps were taken. In this connection, I wish to offer a cautionary statement. It is tempting to think in terms of "reasoning ability", to think of some people as systematically reasoning logically and of others as following different, nonlogical systems over a variety of reasoning tasks. There is no strong evidence favoring such a conclusion; there are data indicating that people might perform very well (logically, efficiently, accurately) on one reasoning task while having great difficulty with another. Performing well on a particular reasoning task requieres a set of intellectual skills which must be acquired, and the set of skills required varies from one reasoning task to another. All mathematicians are not good chess players.

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