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ATENCIÓN Y GENERACIÓN Y APLICACIÓN DE ESTEREOTIPOS

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Atención y Generación y Aplicación de Estereotipos

Tesis Doctoral presentada por **Elena Cañadas Espinosa** en el *Departamento de Psicología Experimental* para aspirar al grado de Doctora en Psicología, en el Programa de *Doctorado en Psicología* de la Universidad de Granada. En este trabajo se han respetado las pautas que establece la normative de la Universidad de Granada para la obtención del título de Doctorado Internacional.

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"The face is a picture of the mind with the eyes as its interpreter."

Marcus Tullius Cicero

INTRODUCCIÓN

INTRODUCCIÓN

No cabe duda que para desenvolverse en el mundo en el que vivimos es necesario disponer de unas estrategias que nos permitan adaptarnos a cualquier situación de forma flexible. Imagine su día a día, cuando camina de casa a la parada del autobús urbano mientras intenta llamar por teléfono a una amiga. La primera tarea que tiene que llevar a cabo es recorrer el laberinto de calles que le llevan a su destino, sin ser distraído/a mientras trata de entender a su amiga al otro lado del teléfono y evitar todo el ruido ambiental que le dificulta tal misión. Finalmente, una tarea añadida será la de seleccionar el autobús adecuado al que subir, así como tomar la decisión correcta al elegir la parada en la que desea bajar (su destino). Esto es sólo un ejemplo, pero si se fija en las actividades que realiza a diario, se dará cuenta que esta flexibilidad de acción está presente en todas ellas, conduciendo, practicando deporte, leyendo, haciendo la compra, etc. A simple vista, se habrá percatado de su destreza y capacidad para controlar los pasos a seguir en este conjunto de tareas que en muchos casos incluso realiza a la vez. Es más, si mientras las hace le surge un imprevisto, seguramente no le resulte difícil encontrar la manera de hacer frente a él exitosamente. Pero ahora imagine que en lugar de llamar a su amiga, marcó equivocadamente el teléfono de su madre. Incluso en esta situación tan demandante será capaz de improvisar su diálogo y cambiar el discurso de su comunicación de forma natural. El mecanismo que le ha permitido procesar la información rápidamente para adaptar su conducta evitando posibles consecuencias negativas en contextos tan demandantes y cambiantes es el control cognitivo (Verguts y Notebaert, 2008).

Es importante esbozar que un proceso controlado es aquel que opera de forma lenta, serial, voluntaria y flexible, mientras que un proceso automático por el contrario, operará de forma más rápida, en paralelo, pero también más rígida e involuntaria (Posner y Snyder, 1975; Shiffrin y Schneider, 1977, para otras consideraciones en las diferencias entre procesos controlados y automáticos véase Bargh, 1994). Como hemos mencionado, un aspecto importante de los procesos de control es su flexibilidad. De este modo, en situaciones en las que una persona tiene un objetivo claro, estos procesos controlados le ayudarán a seleccionar la información relevante para llevar a cabo la tarea de la forma más rápida y eficaz para la consecución de su objetivo.

Por el contrario, la rigidez de los procesos automáticos obligan a la persona a procesar aquella información que es más saliente, independientemente de si es relevante

o no para la tarea que tiene entre manos. Esto puede ser muy útil para algunas rutinas, como conducir, ya que permite tener más recursos cognitivos disponibles para realizar otras tareas. Sin embargo, los procesos automáticos pueden generar ciertos efectos indeseados en otras situaciones. Este es el caso por ejemplo cuando intentamos formarnos una impresión pormenorizada de una persona, pero rápidamente y de manera automática se activa el estereotipo que tenemos de las personas que pertenecen a su misma categoría social. En este caso, el estereotipo influirá en los juicios que hacemos de dicha persona. Precisamente, esta tesis tiene como objetivo investigar la forma en que se produce este tipo de procesamiento estereotípico cuando percibimos rostros de personas.

La estereotipia parece ser fruto de la asociación entre una serie de atributos y conductas con los integrantes de una categoría social (Tajfel, 1981). La estereotipia se ha caracterizado frecuentemente desde la perspectiva cognitiva como un proceso automático, útil porque permite asimilar y dar estructura a la gran cantidad de información que encontramos tanto en los ambientes que nos rodean como en las personas que encontramos en ellos (Oakes, Haslam y Turner, 1994). Procesar toda la información que nos llega de los entornos sociales en los que vivimos requeriría de una gran disponibilidad de recursos cognitivos y temporales. Así, desde el enfoque más individual en el estudio de los estereotipos se postula que mediante la utilización de estereotipos se consiguen optimizar dichos recursos permitiéndonos ser más eficientes en nuestro día a día. Por tanto los estereotipos, pueden ser entendidos como categorizaciones que ayudan a simplificar y sistematizar toda la información de manera que sea más fácilmente identificada, procesada, influyendo en su posterior recuerdo y recuperación (McGarty, Yzerbyt, y Spears, 2002).

Es importante tener en cuenta que las personas al igual que los ambientes, que hemos mencionado anteriormente en esta introducción, son estímulos complejos. Las personas, su rostro y su aspecto físico en general, representan un tipo de información sensorial muy rica que debe ser procesada. De toda la información sobre el aspecto que recibimos de ellas necesitamos seleccionar la más relevante con el objetivo de formarnos una impresión de ellas (Macrae y Quadflieg, 2010).

Pasaremos a describir a continuación aquellas teorías que desde la psicología cognitiva mejor explican el procesamiento de la información de acuerdo tanto a las características de los estímulos sensoriales como a las metas e intenciones de los perceptores. Es importante tener en cuenta que la información seleccionada será

procesada y va a determinar la respuesta o conducta que una persona lleva a cabo en una situación dada. Dicha conducta en ocasiones puede ser relevante para su propia supervivencia.

1. Atención Selectiva y Procesamiento Controlado

Salimos a la calle y una gran cantidad de información visual (sensorial) nos inunda al mismo tiempo. El ser humano (su cerebro) ha evolucionado de modo que ha desarrollado mecanismos que le ayudan a resolver la ambigüedad de la información y a seleccionar de forma rápida y eficaz la información que es relevante para la tarea que está realizando en un momento determinado e ignorar aquella otra que es totalmente prescindible y por tanto desprovista de utilidad para los objetivos o metas que le atañen. La necesidad de seleccionar información proviene tanto de la inmensa cantidad de estimulación ambiental que percibimos, como de la capacidad limitada que poseemos para procesar dicha información. El mecanismo encargado de proteger el sistema de posibles sobrecargas se denomina *atención selectiva*. Su función es la de guiar de forma controlada los procesos de selección y coordinar la entrada de información, que posibilite la respuesta más eficaz al organismo.

Existen diferentes teorías sobre cómo se produce dicha selección de información. Dichas teorías ponen de manifiesto la necesidad de un filtro, que debe ser flexible para seleccionar la información relevante, mientras que al mismo tiempo debe ser capaz de prevenir el procesamiento de la información irrelevante, lo que conllevará un uso eficiente de los recursos atencionales disponibles. Las principales teorías de filtro (Broadbent, 1958 y Treisman, 1969 -defensores de la selección temprana- y Deutsch y Deutsch, 1963; Norman, 1976 -defensores de la selección tardía-) asumen que el procesamiento se lleva a cabo a través de una selección previa a la identificación. Más concretamente, los estímulos sensoriales son registrados a través de procesos perceptuales tempranos (que operan en paralelo) y posteriormente otros mecanismos se encargan de su análisis semántico y almacenamiento, que finalmente dará lugar a la respuesta (identificación del estímulo).

Broadbent (1958), sugirió que el filtro selecciona la información en base a las características físicas, y que la información seleccionada pasa a través de un canal de capacidad limitada donde se llevan a cabo múltiples discriminaciones simultáneas que

restringen el procesamiento de las características físicas del estímulo entrante. La información perceptual que no ha pasado el filtro es directamente eliminada. El procesamiento semántico (es decir, la decodificación del significado de la información entrante) de la información que no es atendida no estará disponible entre la percepción consciente.

Teniendo en cuenta la teoría de Broadbent, Treisman (1969) desarrolló posteriormente un modelo en el que añadía un estadio posterior de selección de información, en el que la información que no hubiera pasado el filtro perceptual temprano, en lugar de ser eliminada, simplemente era atenuada, siendo aún susceptible de ser recuperada y analizada semánticamente y por tanto de alcanzar niveles superiores (ser almacenada y generar una respuesta de acción). De este modo, el filtro actúa más como un atenuador que delimita el análisis de la información que como un interruptor que la bloquea, impidiendo que se sobrecargue el sistema.

A diferencia de los mencionados modelos de selección temprana, aquellas teorías que proponen una selección tardía, no limitan la capacidad del procesamiento inicial de entradas sensoriales, sino que dicho filtro se sitúa en estadios posteriores (Deutsch y Deutsch, 1963; Norman, 1976). Es decir, en primer lugar se lleva a cabo un procesamiento semántico, sin que la atención lleve a cabo ningún tipo de selección, y posteriormente los estímulos pasan el filtro. Estas teorías proponen, que son los mecanismos neuronales los responsables de reconocer y categorizar los estímulos sensoriales entrantes, implicando tanto la memoria a corto plazo como a largo plazo. Además añaden que el mecanismo de selección está influido a su vez por las expectativas del propio sujeto. Parece lógico pensar en los filtros (independientemente de su ubicación) como herramientas flexibles de control encargadas de seleccionar la información que llega del exterior (entradas sensoriales), ya que tienen en cuenta no sólo las características de los estímulos sino también las metas y expectativas de los perceptores.

Como se ha comentado previamente en los modelos de filtro, los estímulos pasan a formar parte integrante de los sistemas de memoria, y por tanto parece importante profundizar en la relación existente entre éstos y los procesos de control. Así, disponer de una mayor cantidad de información estructurada nos permitirá

seleccionar de forma más rápida y eficaz la información relevante y por lo tanto menor necesidad de procesos de control.

2. Memoria y Procesamiento Controlado

Se ha presentado en el apartado anterior cómo los recursos atencionales son limitados, y por tanto los perceptores tienen la necesidad de seleccionar la información entrante. Del mismo modo ocurre con la capacidad de almacenamiento en memoria (Miller, 1956; Sperling, 1960). Diferentes modelos han propuesto que la información se encuentra almacenada en la memoria de forma jerárquica (Craik y Lockhart, 1972). La información sobre un estímulo es procesada simultáneamente en múltiples niveles dependiendo de sus características. Cuanta más información tengamos sobre una estímulo más niveles de procesamiento existirán asociados a él y más fácil será identificarlo. Esta información parece ser procesada de forma automática e inconsciente implicando que para recuperar un determinado nivel necesitamos atender a él de forma más controlada. Por otra parte, otros modelos como el de Baddeley y Hitch (1974) organizan la memoria en sistemas dirigidos por un ejecutivo central que se encarga de controlar y coordinar el flujo de información entre los sistemas especializados en memoria (lazo fonológico y el "cuaderno visuo-espacial"). Este ejecutivo central es el responsable de intercambiar la atención entre tareas simultáneas, así como seleccionar o ignorar los estímulos que serán almacenados en la memoria a largo plazo. Además el ejecutivo central tiene la capacidad para mantener activos los objetivos del perceptor, por lo que la selección de la información estará guiada por ellos. El ejecutivo central podría relacionarse claramente con los filtros, especialmente tardíos, explicados en el apartado anterior. Nótese, que la información que será procesada y almacenada en ambos casos dependerá del perceptor.

Otra teoría que merece especial mención es la de Collins y Loftus, (1975). Para estos autores, el almacenamiento de la información en memoria, está constituido por una red de conexiones entre los diferentes conceptos que aprendemos a lo largo de nuestra vida fruto de la experiencia. Los conceptos que están relacionados estarían unidos por esas conexiones en memoria, de forma que su recuperación puede estar conectada a la activación de alguno de los conceptos relacionados. Las conexiones se establecen en función de la naturaleza semántica de los conceptos (e.g., gato y perro se

encontrarán cerca ya que pertenecen a la misma categoría, animal), o pueden recuperarse por su cercanía en la red al compartir sonidos, es decir, por su naturaleza léxica, (e.g., cama y rana). La facilidad en la recuperación de los elementos de una categoría depende del número de conexiones establecidos entre los elementos.

La importancia de estas teorías sin duda ha sido demostrada en numerosos estudios y por tanto una revisión pormenorizada de éstos escapa de las pretensiones de la presente tesis doctoral. En este apartado hemos planteado aquellas ideas que posteriormente serán importantes tener en cuenta por su implicación en nuestras series experimentales, donde se volverá a poner de manifiesto la relación entre la memoria y el procesamiento controlado.

3. Atención Selectiva y Aprendizaje Implícito

Tanto la atención como el aprendizaje son procesos fundamentales en el procesamiento visual. Como hemos mencionado, la atención selectiva permite seleccionar la información relevante para nuestra meta e ignorar toda aquella que no lo es. Si la atención no está dirigida al lugar concreto en el momento específico podemos perder una gran cantidad de información que puede ser imprescindible para proseguir con nuestra tarea actual y por tanto reducir la eficiencia de nuestro procesamiento y como consecuencia la reducción de la eficacia de nuestra acción. En casos extremos, la falta de atención nos puede llevar a lo que recientemente se ha denominado "ceguera por inatención"[1] (Mack y Rock, 1998) y/o ceguera atencional[2] (Chun y Potter, 1995; Raymond, Shapiro, y Arnell, 1992).

Se ha demostrado que las personas somos capaces de procesar información visual de forma más eficiente cuando tenemos experiencia previa con la información que vamos a procesar (Bierderman, 1972), es decir, cuando posemos un esquema que determina el aprendizaje previo ya almacenado, bien explícita o implícitamente. En nuestro trabajo de investigación, y con el procedimiento utilizado el tipo de aprendizaje que los participantes parecen generar es de tipo implícito (ver discusión). Nos

[1] Acto subconsciente que depende del funcionamiento de las redes atencionales. Se estudió a través de experimentos en los que los participantes tenían que atender a unas figuras con forma de cruz y debían determinar que lado de la cruz era el de mayor longitud. Durante esta tarea a los participantes se les presentaban otras figuras de las que no eran conscientes, y de ahí el nombre del efecto.

[2] Efecto que se produce por la sucesión rápida y muy próxima de dos estímulos objetivos, provocando que el segundo de ellos no sea percibido, presumiblemente por no existir recursos atencionales disponibles para ello.

centraremos por tanto a continuación a describir brevemente la relación entre dicho aprendizaje implícito y la atención selectiva. Recientes investigaciones (Chun y Jiang, 1998,1999) han mostrado que el aprendizaje implícito ayuda al perceptor a formar una estructura organizada del mundo visual. En otras palabras, el aprendizaje parece guiar el sistema atencional, de modo que le ayuda a seleccionar aquella información que es relevante según informa el esquema que hemos creado a partir de la experiencia previa. Chung y cols. (Chun, 2000; Chun y Jiang, 1998,1999; Chung y Nakayama, 2000; Chun y Phelps, 1999) han demostrado mediante tareas de búsqueda visual, que el aprendizaje implícito de los contextos visuales puede guiar la atención hacia los estímulos objetivos. Además, la cantidad de recursos atencionales disponibles va a determinar también la cantidad de aprendizaje implícito que podemos alcanzar (Nissen y Bullemer, 1987). Por tanto parece existir una interacción bidireccional entre atención y aprendizaje implícito.

Uno de los primeros estudios demostrando la bidereccionalidad o interacción entre los procesos de aprendizaje y atencionales fue llevado a cabo por Chun y Jiang (1998). En él emplearon una tarea de búsqueda visual, en la que los participantes tenían que localizar una letra objetivo (target) "T" rodeada de letras distractoras "L" invertidas. Durante 24 bloques de ensayos, manipularon que el target se encontrara en la misma posición y la misma configuración espacial. En cada bloque, la localización podía ser consistentemente emparejada con la misma configuración (Schneider y Shiffrin, 1977; Shiffrin y Schneider, 1977), o emparejada con una configuración nueva. Los resultados mostraron que los participantes eran más rápidos en los ensayos consistentes (donde la configuración era la misma), que en aquellos donde la configuración era aleatoria. Este dato sugiere que los participantes no sólo aprendían la configuración sino también la asociación consistente con la localización del target. Por tanto, se podría afirmar que los participantes adquirían un conocimiento contextual que guiaba su búsqueda visual, su atención, hacia la localización del target. Efecto que ha sido denominado "clave contextual" (contextual cueing). Además, dado que los participantes no informaron ser conscientes de las configuraciones espaciales utilizadas, se puede a su vez sostener que se trata de un aprendizaje implícito.

Del otro lado, la atención puede afectar también el aprendizaje implícito. Así lo demostraron Jiménez y Méndez (1999) mediante una tarea de respuesta serial (TRS) en la que el participante tenía que atender y responder a la localización de los estímulos. Como en todas las tareas tipo TRS la secuencia de presentación estaba predeterminada,

pero dicha manipulación era totalmente desconocida para los participantes. Para estudiar el papel de la atención como modulador del aprendizaje, Jiménez y Méndez introdujeron una variable en la que la forma de los estímulos podía ayudar a los participantes a predecir la localización del siguiente target. Por tanto, la predictibilidad de la forma contribuía a la ejecución de la TRS únicamente cuando la forma era atendida. Los resultados mostraron que el aprendizaje no se veía afectado cuando se limitaban los recursos disponibles (utilizando una tarea al mismo tiempo). Estos resultados ponen de manifiesto la importancia de la atención selectiva en el aprendizaje implícito. Además, esta disociación subraya la necesidad de distinguir entre selección de recursos y esfuerzo (Kahneman, 1973). Jiménez y Méndez, en la línea de lo sugerido por otros autores (Stadler, 1995; Stadler y Frensch, 1998) proponen que el aprendizaje implícito es un procesamiento asociativo automático que no depende de los recursos atencionales. Sin embargo, la forma de los estímulos en la tarea que propusieron, debía ser necesariamente atendida para producir la disociación entre dicha forma y la localización que debía ser aprendida.

Estos estudios ponen de manifiesto la interrelación existente entre los sistemas cognitivos, memoria, aprendizaje y atención, y como todos a su vez modulan el control cognitivo. Dando un paso más en esta introducción nos centraremos en lo que será el marco que da forma a esta tesis, el *contexto*, y como éste va a ser un factor determinante y determinado por los procesos cognitivos mencionados hasta ahora.

4. Control Atencional y Contexto

Comenzábamos esta introducción con un claro ejemplo de cómo los procesos cognitivos interaccionan entre ellos para facilitar nuestros objetivos diarios. Planteábamos un escenario donde todos esos procesos tenían lugar, en el ejemplo la parada del autobús o el laberinto de calles hasta llegar a ella. En nuestro ejemplo, éste sería el contexto. De igual modo, plasmábamos la necesidad de un procesamiento flexible, capaz de adaptarse a diferentes situaciones o contextos para facilitar una mejor ejecución de las tareas y objetivos a los que nos enfrentamos.

El estudio de la flexibilidad de los procesos atencionales dependiendo del contexto ha sido estudiada desde la psicología cognitiva utilizando aquellos procedimientos que permiten estudiar el control cognitivo, tales como las Tareas Stroop

(Stroop, 1935)[3] y las Tareas de Flancos (Eriksen y Eriksen, 1974)[4]. Ambas pruebas muestran una latencia en la respuesta entre los ensayos congruentes e incongruentes, lo que ha sido denominado efecto de interferencia[5].

Es importante aclarar, que en nuestras series experimentales, daremos un salto en la consideración de contexto. Éste, es normalmente entendido como un entorno físico o una situación donde tiene lugar un evento. Así, en nuestro diseño experimental, las rostros se convertirán en un tipo especial de contextos al ser los marcos de referencia donde se presenta la tarea que debe realizar el participante. Por tanto, si el participante determina que dichos rostros son relevantes para la tarea, los procesará de forma más detalla que si por el contrario piensa que son irrelevantes para la misma.

Pero, *¿cómo se puede ver el control atencional afectado por el contexto según lo expuesto anteriormente?* Si pensáramos que la atención es controlada automáticamente, predeciríamos que los efectos de interferencia deberían ser totalmente insensibles al contexto. Sin embargo, numerosas investigaciones han demostrado que estos efectos de interferencia pueden ser modulados por factores que afectan al control de arriba-a-abajo en los procesos perceptivos. Concretamente, se ha demostrado que cuando en una sesión experimental la mayoría de los ensayos son congruentes, (i.e., las flechas que aparecen a un lado y otro de la flecha "target" apuntan en la misma dirección que ella, o el color de la tinta que hay que nombrar coincide con el nombre de la palabra), el efecto de interferencia es mayor que cuando la mayoría de los ensayos son incongruentes (Gratton, Coles, y Donchin, 1992; Logan y Zbrodoff, 1979; Lowe y Mitterer, 1982; West y Bayliss, 1998).

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[3] Nombrar el color de la tinta en que está escrita una palabra que hace referencia a un color. Por ejemplo, ROJO – AZUL. Aunque la respuesta que correcta que debería dar el participante es la misma, "rojo", el que en el segundo caso la palabra escrita y el color de la tinta sean distintos (estímulos incongruentes), da lugar a lo que se conoce como "efecto Stroop", o interferencia semántica que se ve reflejada en el aumento del tiempo de reacción (TR) de la tarea, favoreciendo a su vez la comisión de errores.

4 Existen muchas variantes de dicha prueba, pero describiremos a continuación la que utilizaremos en el procedimiento de esta tesis. Consiste en discriminar la dirección de una flecha central, flanqueada por dos flechas a cada lado de la misma. Estas flechas (flancos) pueden ir en la misma dirección que la flecha central (congruentes) o en la dirección contraria (incongruentes). Por ejemplo, -> -> -> -> -> | <- <- -> <- <- . En ambos casos la respuesta correcta consistiría en pulsar la tecla de la derecha, indicando que la flecha apunta hacia la derecha. Sin embargo, como ocurre en la tarea Stroop, ante ensayos incongurentes, los flancos producen mayor interferencia a la hora de llevar a cabo la tarea, incrementado el TR y un mayor número de errores.

[5] A lo largo de nuestras series experimentales preferimos utilizar el término "efecto de congruencia", calculado como la diferencia en el TR utilizado para responder a los ensayos incongruentes menos los congruentes.

¿Cómo se explican dichos efectos? Lo más intuitivo es pensar, que los participantes en las tareas Stroop elegían la estrategia a seguir en función del tipo de sesión experimental a la que eran asignados. Así, cuando se encontraban ante una alta proporción de ensayos congruentes, decidían dejarse llevar por la estrategia de leer la palabra, lo cual producía una mayor rapidez en los ensayos congruentes, pero al encontrarse con los incongruentes (que ocurrían en menor proporción y por tanto eran más inesperados para ellos), sus respuestas eran muy lentas, y/o cometían muchos errores. Por el contrario, los participantes que eran asignados a las condiciones de baja proporción de ensayos congruentes adoptaban una estrategia más conservadora, inhibiendo la tendencia innata a leer la palabra, lo cual a pesar de enlentecer la respuesta en los ensayos congruentes, a su vez producía una reducción de la interferencia procedente de los ensayos incongruentes (que eran más frecuentes), y por consiguiente, producía un menor efecto de congruencia.

Sin embargo esta idea ha sido puesta en entredicho y han surgido dos posibles alternativas que pasamos a detallar a continuación: procesamiento controlado dependiente del ítem, propuesta por Jacoby, Lindsay y Hessels, (2003) y un procesamiento controlado dependiente del contexto, propuesta por Crump, Gong, y Milliken, (2006).

4.1 Procesamiento Controlado Dependiente del Item

La lógica de este tipo de control recae en que el procesamiento de los distractores (especialmente en los ensayos incongruentes) es controlado rápidamente en función del ítem específico con el que el participante es presentado. Para poner a prueba esta hipótesis, Jacoby y cols. (2003) utilizaron una tarea Stroop, en la que la proporción de congruencia de los ítems era manipulada en diferentes conjuntos de ítems Stroop. Es decir, tres colores determinados, (e.g., BLANCO, ROJO, Y AMARILLO) eran asociados a una alta proporción de ensayos compatibles (80% congruentes – 20% incongruentes), mientras que otros tres colores diferentes (e.g., NEGRO, AZUL, Y VERDE), formaban parte del conjunto de ítems de baja proporción de congruencia (20% congruentes -80% incongruentes). Para impedir que los participantes aprendieran la manipulación, y no pudieran predecir la sucesión de los estímulos a lo largo de la tarea, cada ítem fue presentado un total de 50 veces de forma aleatoria. Los resultados mostraron que la ejecución de los participantes estaba influenciada por la proporción de

ensayos congruentes. Específicamente, encontraron que aquellos ítems que estaban asociados a una alta proporción de congruencia producía mayor efecto Stroop que los que estaban asociados a baja proporción. Por tanto afirmaron que el control atencional se producía al nivel específico del ítem. Los autores, etiquetaron esta diferencia como efecto de proporción de congruencia específico del ítem (Item Specific Proportion Congruent –ISPC effect-).

Jacoby y cols. (2003) concluyeron que los participantes debían de estar "automáticamente controlando" la estrategia que utilizar en cada conjunto de colores-palabras para determinar cuándo leer la palabra o inhibirla en función del conjunto que se presentara. Estos resultados además constituyeron primera evidencia empírica de que los procesos controlados, no son tan lentos y costosos como se pensaba hasta el momento (Posner y Snyder, 1975; Shiffrin y Schneider, 1977). Otra posible explicación de estos resultados, es que los participantes aprendieran que determinados colores conllevaban una respuesta determinada, por ejemplo que el color Rojo estaba frecuentemente escrito en tinta Roja, y por tanto, lo que se asociaba con ellos era una clave contextual (i.e., la palabra en la tarea Stroop) con una respuesta. Aún, otra posibilidad fue propuesta posteriormente por Crump y cols. (2006). Esta nueva alternativa hace referencia a que en realidad el ISPC, pertenece a una categoría más amplia de efectos que ellos denominaron efectos de proporción de congruencia específico del contexto (Context Specific Proportion Congruent –CSPC effect-), en los que los participantes aprenden la asociación entre un contexto y la proporción de congruencia. Pero veamos más detalladamente como estudiaron dicha alternativa.

4.2 Procesamiento Controlado Dependiente del Contexto

Crump y cols. pretendían probar su CSPC, para ello diseñaron un simple procedimiento de priming, tarea en la cual se les pedía a los participantes que nombraran el color de una forma que se presentaría en la pantalla precedida de una palabra-color (prime). Utilizaban cuatro palabras que podían servir como primes (ROJO, VERDE, AZUL Y AMARILLO). Las formas podían ser o *círculos* o *cuadrados*, y manipulaban que la forma estuviera localizada en dos posiciones diferentes, *arriba* o *abajo* del punto de fijación, denominando a cada localización *contexto* (en estos contextos tanto la forma como la localización daban información redundante, así el círculo por ejemplo aparecía siempre arriba y el cuadrado abajo, o viceversa). Cada contexto estaba asociado con una diferente proporción de congruencia.

De modo que para un participante dado, la localización/forma; *arriba/círculo*, estaba asociada a alta proporción de congruencia (High Proportion Congruent –HPC-)[6] entre la palabra prime y la localización/forma, mientras que la localización/forma; *abajo/cuadrado,* estaría asociada a un baja proporción de congruencia (Low Proportion Congruent –LPC-) entre la palabra prime y la localización/forma. Ambos contextos (forma/localización) se combinaron con la proporción de congruencia de modo que existían 4 condiciones distintas que fueron contrabalanceadas entre participantes (Figura 1). Los resultados mostraron un mayor efecto de interferencia (congruencia) en los contextos asociados a HPC, independientemente de la forma/localización y la respuesta, y de la asociación entre la palabra y el color, ya que cada contexto estaba asociado por igual con cada respuesta. De ahí la denominación que sus autores otorgaron a tal efecto, "Efecto de proporción de congruencia específico al contexto (CSPC)". Estos resultados sugieren que las claves contextuales, pueden controlar rápidamente la asociación entre un contexto que a priori es irrelevante para la tarea y la proporción de congruencia.

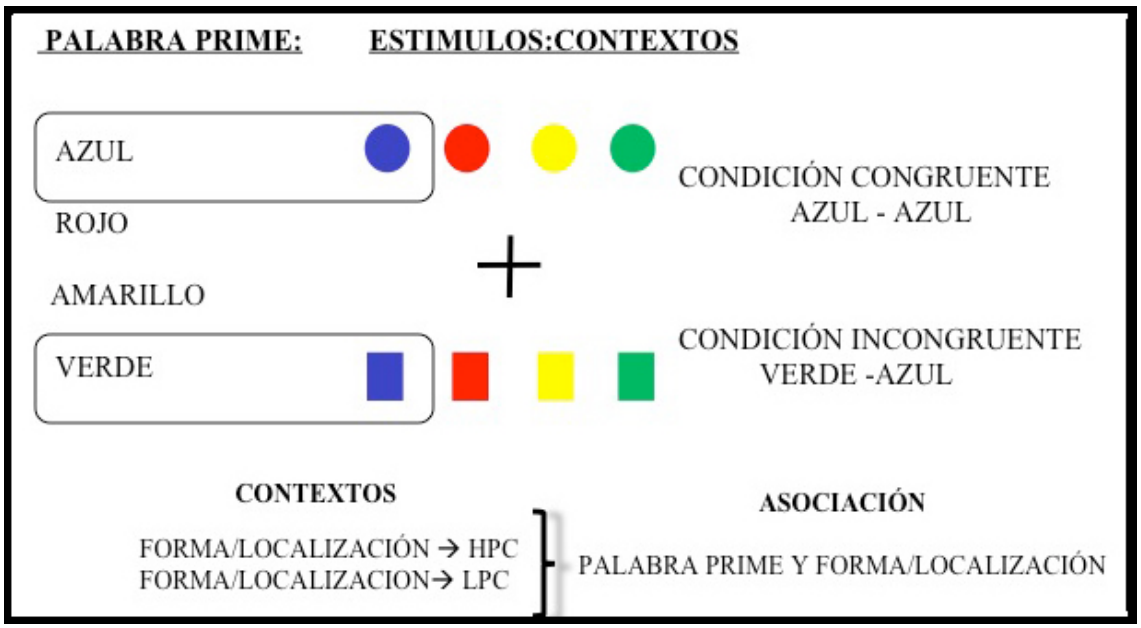

Figura 1: Reproducción del procedimiento seguido por Crump, y cols. (2006) para el estudio del efecto de proporción de congruencia específico del contexto.

En esta literatura emergente se han utilizado diferentes dimensiones perceptuales como estímulos para producir el efecto CSPC (Bugg, Jacoby, y Toth, 2008; Crump y

[6] Con la finalidad de ir introduciendo al lector con las siglas que utilizaremos a continuación en las series experimentales, hemos considerado adecuado presentarlas desde esta introducción en inglés.

cols., 2006, Crump, Vaquero, y Milliken, 2008; Lehel y Hübner, 2008; Vietze y Wendt, 2009; Wendt y Kiesel, 2011) pero en ninguno de ellos se ha utilizado estímulos sociales como contextos, esto es, como estímulos presentes en los ensayos, pero no relevante para la tarea a realizar. Este es uno de los objetivos de la presente tesis doctoral.

4.3 Consideraciones Finales: Asociación Estímulo-Respuesta o Distribución de Control en Función de la Proporción de Congruencia Específica al Contexto

El creciente interés en el estudio de los procesos cognitivos y sus mecanismos subyacentes han llevado a recientes investigaciones a plantearse, si el efecto de proporción de congruencia asociado al contexto refleja puramente la distribución de recursos atencionales en función de la proporción de congruencia asociada a cada contexto o si por el contrario se trata de un aprendizaje asociativo entre un estímulo específico y su respuesta (Schmidt y Besner, 2008).

Schmidt y Besner proponen de que una simple contingencia podía explicar el efecto ISPC (y probablemente el resto de los efectos de proporción de congruencia, CSPC). Para ello, en una primera comprobación, reanalizaron los datos de Jacoby y cols. (2003). Cuando el efecto Stroop era analizado en función de la predictibilidad de las palabras (i.e., contingencia), el tipo de ensayo Stroop (congruente, incongruente) no interaccionaba con la contingencia ni en tiempo de reacción ni en porcentaje de errores. Estos resultados confirmaron a los autores que el efecto de ISPC (interacción existente entre la proporción de congruencia y el tipo de ensayo Stroop) se debe tanto al efecto principal del tipo de ensayo Stroop como al efecto principal de contingencia.

Estos hallazgos tienen importantes implicaciones para las teorías de monitorización del conflicto desarrolladas por Botnivick, Braver, Barch, Carter, y Cohen (2001). Botvinick y cols. propusieron que la mayoría de los efectos derivados de tareas Stroop y paradigmas similares pueden ser explicados desde los mecanismos que se encargan de monitorizar el conflicto, los cuales han sido localizados en el córtex cingulado anterior. De acuerdo con la hipótesis del monitorización del conflicto, el córtex cingulado anterior detecta cuando tiene lugar un conflicto (p.e., cuando una palabra referente a un color y el color de la tinta, pueden generar en el participante dos posibles respuestas). Una vez detectado este conflicto, la atención se focaliza en el estímulo objetivo. Además, Botvinick y cols. han explicado el efecto de proporción de congruencia utilizando la monitorización del conflicto debido a efectos secuenciales (ya

que la atención dirigida al estímulo objetivo se incrementa después de un ensayo incongruente),por lo que cuando la mayoría de los ensayos son incongruentes, como es el caso de la condición de baja proporción de congruencia, se dirige más atención hacia los estímulos objetivos, en este caso el color.

Sin embargo, estudios posteriores han encontrado resultados que no confirman esta explicación. Así, Bugg, Jacoby, y Chananni, (2011) están de acuerdo con la asunción de que la dimensión "palabra" en la tarea Stroop actúa como señal que va a dirigir el procesamiento posterior. Sin embargo, Bugg y cols. defienden la postura del control, según la cual la palabra constituye una clave que indica la proporción de congruencia específica de los ítems, al encontrarse asociada con estímulos determinados que modularan la lectura de la palabra (para dar su respuesta al color) facilitándola o inhibiéndola. Como demostraron Jacoby y cols. (2003), en las condiciones asociadas a HPC se facilita la lectura de la palabra, en cambio en las asociadas a LPC se inhibe. Según, Schmidt y Besner (2008), la palabra actuaría como señal de las contingencias estímulo-respuesta que están asociadas con ensayos particulares, lo que maximizaría la probabilidad de un tipo de respuesta, la más frecuentemente emparejada con ese ensayo (ítem) particular (ya que la palabra no sería indicativa de ninguna información a cerca de la proporción de congruencia per se).

Para poner a prueba esta idea, Bugg y cols., (2011) idearon un procedimiento en el cual utilizando una tarea Stroop de palabras – imágenes, en la que los participantes tenían que responder a la palabra inserta dentro de una imagen, que podía ser congruente (dibujo de un gato con la palabra "gato" en su interior) o incongruente (el dibujo de un perro con la palabra "pez" en su interior). Como en estudios anteriores, (Bugg y cols. 2008, Experimento 1; Jacoby y cols. 2003, Experimentos 2a,2b y 3) utilizaron cuatro palabras (pájaro, gato, perro, y pez), dos de ellas (p.e., pájaro y gato) eran asociadas a HPC y las dos restantes (p.e., perro y pez) eran asociadas a LPC. Además como ocurría en los citados estudios previos, los conjuntos no se solapaban (es decir que la palabra pájaro, nunca aparecía presentada junto a la imagen de un perro o un pez). De este modo, palabras e imágenes se presentaban el mismo número de veces, siendo tanto la palabra como la imagen, igualmente representativas de la proporción de congruencia de los ítems particulares. Además, para poner a prueba las críticas suscitadas por Schmidt y Besner (2008), incluyeron en el diseño, un bloque adicional nuevo, en el cual se entremezclaban con el set inicial de estímulos, lo que denominaron "estímulos de transferencia". Estos estímulos de transferencia, consistían en las palabras

previas, superimpuestas en nuevas imágenes de los estímulos anteriores, (i.e., diferentes imágenes de pájaros) que tenían asociada una proporción de congruencia del 50% (50% congruentes y 50% incongruentes). Los resultados, para los ensayos previos asociados diferente proporción de congruencia, replicaron el efecto de ISPC. Así, se encontró un mayor efecto de interferencia en los ensayos asignados a HPC frente a aquellos asociados a LPC. En los estímulos de transferencia, si como afirmaban Schmidt y Besner (2008) existiera un efecto de contingencia para explicar los efectos del ISPC, estos análisis deberían mostrar un efecto principal tanto del tipo de ensayo como de la contingencia, pero no una interacción entre ellos. Por el contrario, si el control juega un papel importante en la producción de efecto ISPC, entonces se debería obtener una interacción significativa. Este resultado por tanto, debería obtenerse si la imagen en lugar de la palabra fuera una señal más potente que la palabra para señalar la proporción de congruencia en este paradigma imagen-palabra. Los resultados de Bugg y cols. (2011) confirman que el control es determinante en la producción del efecto de ISPC, al transferirse la información procedente de las imágenes previas a los nuevos estímulos con los que el participante no ha tenido experiencia previa, y en los que no existe manipulación de proporción de congruencia asociada.

Del mismo modo, en un trabajo previo, Crump y Milliken (2009) en su afán por defender la hipótesis del control como generador del efecto del CSPC y no dirigido por frecuencia de eventos o una simple asociación estímulo respuesta (Logan, 1988; Schmidt y Besner, 2008) diseñaron un procedimiento, en línea con los trabajos previos, Crump y cols. (2006, 2008) previamente detallados en el apartado 1.4.2. En él se intercalaron ítems de transferencia, que consistían en pares de palabras de diferentes colores, que como ocurría en el estudio de Bugg y cols. (2010), no estaban asociados a ninguna proporción de congruencia específica. Recuerde que en esta línea de trabajos, no es el ítem el que se asocia a una proporción de congruencia, sino la localización donde se presenta, por tanto esta asociación color-palabra, independientemente de que se presentara arriba o abajo del punto de fijación, estaría asociada a 50% de congruencia e incongruencia. A diferencia de Bugg y cols. (2011) los ensayos de transferencia se presentaban entremezclados entre los ítems de aprendizaje (asociados a una manipulación de congruencia), y no en un bloque distinto. Sus resultados, replicaron el efecto de CSPC (donde la interferencia se ve disminuida en los contextos asociados a LPC). Además, este efecto era transferido a los ensayos de transferencia , lo que puso

de manifiesto que tal efecto no puede ser debido como indicaban Schmidt y Besner (2008) a un mero proceso de aprendizaje que depende de la frecuencia de los eventos, y por tanto no puede ser determinado por la asociación estímulos-respuesta.

En resumen, estos estudios demostraron que el control atencional se administra de forma flexible y rápida y que parece estar influido por los aprendizajes previos, bien respecto a los ítems de una categoría o a los contextos donde están asociados. En esta línea, parece muy importante utilizar estos procedimientos como medida para el estudio de los procesos de categorización, a través de las asociaciones de determinados contextos a determinadas respuestas, con el objetivo, entre otros, de analizar cómo esos aprendizajes pueden ser transmitidos a nuevos ítems que sean presentados en dichos contextos.

Como hemos mencionado en repetidas ocasiones a lo largo de esta introducción, la cantidad de información que encontramos en nuestro día a día es tan grande que sería imposible procesarla toda sin producir una sobrecarga en nuestros sistemas atencionales, de memoria y de aprendizaje. Para ello, tal como hemos tratado en el presente apartado, existen estrategias de selección de la información que es relevante, en función, por ejemplo, del aprendizaje previo que tenemos almacenado en memoria. Los contextos sociales, donde generalmente nos encontramos con varias personas y estamos expuestos a numerosos estímulos ambientales que acompañan dichos encuentros, constituyen ejemplos paradigmáticos de situaciones en las que nos encontramos con sobrecarga de información a procesar. Sin duda, en estos contextos sociales los procesos cognitivos de control, serán de ayuda en el procesamiento de dicha información, y en la interacción con los otros.

En el siguiente apartado detallaremos la importancia del rostro humano como fuente de información muy valiosa para los perceptores por su gran relevancia para determinar la calidad de las interacciones sociales (Johnson y Morton, 1991). A continuación introduciremos algunos estudios en los que se evidencia la cantidad de información que puede ser extraída de los rostros de individuos, así como el empleo que hacen los perceptores de dicha información.

5. La percepción de rostros

La cara se ha convertido sin duda en la principal fuente de información que permite a las personas interactuar entre ellas, no sólo como individuos sino como grupos dentro de la sociedad en la que vivimos. La cara es una de las primeras fuentes de información visual disponible para un perceptor. Así, un breve encuentro cara a cara con una persona desconocida es suficiente para obtener información relativa a su sexo, edad, raza, estado emocional, e incluso algunas características de personalidad de la persona percibida (Bruce y Young, 1986). Pero no sólo eso, sino que además permite realizar juicios sorprendentemente acertados sobre sus rasgos de personalidad, su orientación sexual, su religión y las intenciones de conducta que tiene (Ambady, Hallahan, y Rosenthal, R. (1995); Naumann, Vazire, Rentfrow, y Gosling, 2009). Sin duda, esta información predispone y da forma a las futuras interacciones sociales (Snyder, Tanke, y Berscheid, 1977; Todorov, Mandisodza, Goren, y Hall, 2005). Además, no es necesario el contacto cara-a-cara para utilizar el rostro como fuente de información para formarse una impresión de una persona, ya que con el desarrollo de las nuevas tecnologías, los rostros están presentes a través de fotografías en diferentes contextos, tales como páginas web (Marcus, Machileik, y Schütz, 2006; Vazire y Gosling, 2004) y, las ahora de moda, redes sociales (e.g., Facebook; Buffardi y Campbell, 2008; Gosling, Gaddis, y Vazire, 2008).

5.1. Algunas categorías identificables a partir del rostro

Un gran número de estudios relativamente recientes sugieren que la categorización social es únicamente automáticamente condicionada. En esta dirección, investigaciones al respecto han demostrado que la eficacia y rapidez con la que se produce la categorización social varía en función de la tipicidad de los ejemplares (p.e. Blair, Judd, y Fallman, 2004; Livinston y Brewer, 2002; Maddox y Chase, 2004; Maddox y Gray, 2002), las condiciones en las que se procesan (Cloutier y Macrae, 2007; Cloutier, Mason, y Macrae, 2005), así como los objetivos del perceptor (Macrae, Quinn, Mason y Quadflieg, 2005).

A continuación haremos una revisión de aquellas características fácilmente identificables a partir del rostro, que han sido fruto de amplia investigación en la literatura sobre percepción social. A partir de ellas los individuos son capaces de

categorizar a las personas percibidas, incluyéndolas en categorías sociales que luego resultan muy relevantes en sus interacciones sociales. En consonancia con los estudios que presentamos en las series experimentales del presente trabajo, nos detendremos un poco más en aquellos estudios que se centraron en el sexo como una de las categorías más fácilmente extraída al percibir una cara.

5.1.1. Sexo

El sexo biológico es fácilmente perceptible y diferenciable. Numerosos estudios han mostrado que desde la infancia, antes del año de vida, los niños aprenden a utilizar esta categoría para percibir a los demás (Leinbach y Fagot, 1993;Verkuyten, Masson, y Elffers, 1995; Yee y Brown, 1994). A lo largo de la vida, la utilización de esta categoría se va reforzando con los atributos que estereotípicamente se asocian a cada sexo. Existen una serie de señales visuales presentes en el rostro que permiten al perceptor diferenciar muy rápidamente entre los miembros de esta categoría, tales como la longitud del pelo (Macrae y Martin, 2007), las áreas de los ojos y las cejas, la nariz y la boca (Brown y Perret, 1993). Además, los adultos somos capaces de distinguir entre hombres y mujeres incluso cuando se han minimizado (o incluso eliminado) algunas de estas señales, como el pelo, maquillaje, vello facial, etc (Bruce, y cols., 1993).

Por otra parte, la distinción hombre-mujer parece ocurrir muy rápido tras la observación de un rostro (Mouchetant-Rostaing y Girad, 2003). Estos autores encontraron que cuando presentaban a sus participantes imágenes de caras de hombres y mujeres en comparación con caras pertenecientes a una única categoría (p.e., todos hombres), su respuesta medida a través de potenciales evocados (ERP) asociada a áreas frontales-centrales era modulada a los 145 ms de la presentación de la imagen. En otras palabras, los electrodos localizados en esas zonas detectaban muy tempranamente la existencia de dos categorías (cambio) produciendo una mayor activación en comparación con la situación en la que la categoría de los estímulos objetivos era la misma (no cambio). Estos resultados han sido replicados tanto para la categoría edad (Mouchetant-Rostaing, Giard, Bentin, Aguera, y Pernier, 2000), como para el color de piel (Ito y Urland (2003). Estos datos demuestran que la información proveniente de estas categorías sociales es rápida y fácilmente accesible e influye en el procesamiento facial.

Por otra parte, un gran número de estudios ha demostrado que la categoría sexo afecta el modo en que las personas recordarán y procesarán información sobre sus

interacciones sociales (Beauvais y Spence, 1987; Frable y Bem, 1985; Taylor y Falcone, 1982). Todos estos resultados en su conjunto ponen de manifiesto que el sexo es una categoría importante que el perceptor usa para extraer informaicón de las personas.

5.1. 2. Estado emocional

Existe y existirá un amplio debate sobre si la expresión facial de las emociones es algo innato o cultural, y por tanto aprendido. Mientras los defensores de la primera postura defienden que todos somos capaces de producir e identificar una amplia variedad de emociones que se consideran *básicas* (Ekman, 1972, 1992), los defensores de la segunda postura, en cambio, defienden que hay cierta variabilidad cultural en la denominación de las emociones, por lo que concluyen que hay cierta especificidad cultural (Russell, 1994).

Sin embargo, no cabe duda que saber identificar una emoción correctamente es crítico para las interacciones sociales e incluso para nuestra supervivencia. Dado que la expresión de una emoción ocurre a menudo durante un periodo de tiempo muy corto, su procesamiento lo basamos en imágenes fugaces del rotro, que utilizamos para tomar decisiones sobre el mismo.

En general se considera que experimentar una emoción no solamente implica un sentimiento interno sino que a su vez se ve reflejado en el rostro. Al igual que en el caso de la edad, los autores que abogan por la universalidad de las emociones proponen que cada experiencia emocional se ve caracterizada por unos rasgos faciales característicos, unos movimientos faciales fácilmente identificables, lo que permite al observador poder identificar de qué emoción se trata y en consecuencia poder reaccionar (Ekman, 1992, Ekman y Friesen 1975, Izard, 1971).

Categorizar una emoción, al igual que ocurre con los objetos, requiere la identificación y la agrupación de las características que definen cada emoción. Para ello, debemos atender a aquellas características que son específicas de la emoción (forma de los labios, cejas, arrugas alrededor de los ojos) que se plasmará en una representación mental de las mismas, así como de sus reacciones afectivas (Bower, 1981; Forgas, 2000).

Al igual que otras categorizaciones como las basadas en el el sexo o el color de la piel, la habilidad para reconocer y discriminar entre emociones surge también muy temprano en las etapas del desarrollo (Nelson, 1987; Saarni, Mumme, y Campos, 1997). Se produce en tiempos tan breves como 100 ms después de la presentación del rostro

(Sweeny, Suzuki, Grabowecky y Paller, 2012). En ocasiones las expresiones emocionales faciales pueden ser procesadas incluso de forma involuntaria (Dimeberg, Thunberg y Elmehed, 2000) o sin la conciencia siquiera de haber visto la cara (Li, Zinbarg, Boehm, y Paller, 2008; Murphy y Zajonc, 1993; Sweeny, Grabowecky, Suzuki, y Paller, 2009; Whalen y cols., 1998). Además se ha demostrado que la facilidad del perceptor para agrupar las emociones puede estar influida por la capacidad de éstas para producir esta emoción en el perceptor. O dicho de otra forma, la medida en la que una persona es capaz de experimentar una emoción al ver un rostro emocional va a influir en la medida en la que éste percibe y categoriza la emoción (Forgas y George, 2001; Niedenthal y Halberstadt, 2000; Niedenthal y Setterflund, 1994).

5.1. 3 Otras características que nos ayudan a categorizar: el color de la pie y la edad

En 1758 Carolus Linnaeus propuso que la especie humana estaba compuesta de categorías, sobresaliendo el *color de la piel* (rojo, amarillo, blanco y negro) como uno de los principales marcadores raciales. Aunque esta afirmación ha sido criticada tanto desde perspectivas sociales como científicas, la tendencia a utilizar el color de la piel para categorizar a las personas parece ser un proceso automático. Así, al igual que el sexo, la raza es identificable por un observador de una edad tan temprana como los 9 meses de edad (Anzures, Quinn, Pascalis, Slater y Lee, 2010). En adultos incluso en presentaciones tan rápidas como 122 ms tras la presentación de la cara (Ito y Urland, 2003). Estos datos indican que el color de la piel parece estar influyendo en la percepción de los rostros incluso antes de que se realice un análisis completo de la cara (Mouchetant-Rostaing y cols., 2000). Sin embargo, se ha mostrado que en la categorización de las personas por su raza, no solamente es importante el color de la piel, sino también otras características faciales identificativas de la raza (rasgos faciales,, por ejemplo nariz ancha y grandes labios en personas negras, Bar-haim, Saidel y Yovel, 2009; Macrae y Quadflieg, 2010).

Por su parte, no cabe duda que la *edad* también queda marcada en nuestro rostro. Nuestras facciones cambian a medida que cumplimos años, lo que hace más fácil al perceptor poder acotar nuestro rango de edad e incluirla en determinadas categorías (e.g. adolescente, joven, adulto, mayor). Un estudio muy detallado (Kogan, 1979), en el que se manipulaba la edad y género de unos rostros demostró esta facilidad para determinar la edad de diferentes rostros de hombes y mujeres de diferentes edades, y sexo. Además mostró que es a partir de edades más avanzadas cuando es más difícil

encontrar límites bien definidos entre unas categorías de edad y otras. Recientemente con el desarrollo de las tecnologías de la computación se ha conseguido evaluar la presencia de arrugas en las regiones principales de la cara, ojos, nariz, boca, barbilla y frente, y relacionarlas con el desarrollo evolutivo y la consiguiente facilitación de su categorización por edades (para más detalle véase, Kwon y Da Vitoria Lobo, 1999).

Como ocurre en cualquier otro tipo de categorización, las personas se forman impresiones a partir de la percepción de una serie de características salientes de los individuos para posteriormente asociarles otra serie de rasgos no visibles en forma de actitudes, emociones, expectativas, creencias, o características de personalidad (Lennon, 1992; Litman y cols., 1983). Esta utilidad otorgada a la categorización en los procesos de percepción social se remonta a los trabajos de Lippmann (1922) y Allport (1954) en los que ya se proponía que los perceptores no pueden hacer frente a la complejidad de su medio ambiente, por lo que lo "simplifican" (Operario y Fiske, 2001) para funcionar socialmente con efectividad. La categorización de personas reduce las similitudes percibidas entre los miembros de un mismo grupo, a la vez que acentúa las diferencias entre grupos (Queller, Schell, y Mason, 2006). Todo ello nos permite comprender mejor la información que se encuentra en el ambiente que nos rodea. Pero en el proceso de categorización social es crucial prestar atención solamente a ciertas características de las que definen a los individuos para acentuarlas y extrapolarlas al resto de los individuos que pertenecen a esa misma categoría (Allport, 1954). Aunque análisis posteriores al realizado por Allport han refinado este punto de vista, sigue habiendo cierto acuerdo en el papel central de la atención en los procesos de categorización social. Así, tanto los modelos cognitivos (p.e., Medin y Schaffer, 1978; Nosofsky, 1986, 1988) como sociales (Smith y Zarate, 1992) posteriores definen la categorización como el resultado de atender a dimensiones características de los estímulos.

En relación a la percepción de caras, la posibilidad de que las caras poseen un status especial dentro del sistema visual es aún fruto de cierto debate (Berker, 2002; Bogen y cols., Farah, 1995; Farah y cols., 1998; Gauthier y Tarr, 1997; Gauthier, Skudlarski, Gore, y Anderson, 2000; Kanwisher, McDermott y Chun, 1997; Tovee, 1998; Ro y cols, 2001;). La relación entre determinados aspectos del procesamiento facial y la forma en que dicho procesamiento es influido por procesos atencionales no está totalmente clara. Por tanto, es importante profundizar en el análisis sobre la forma en que el procesamiento y la codificación temprana de la categorización de rostros de personas y la percepción social en general pueden ser modificadas.

En relación a lo anterior, otro aspecto a tener en cuenta respecto a los procesos de categorización social es que son muy sensibles al contexto. Asi, los juicios de similitud o diferenciación intra e inter categoriales no quedan definidos a priori, sino que son flexibles y dinámicos, variando en función del contexto de comparación (Turner, 1985). Por tanto, tal y como veremos más adelante, el contexto es una clave que influirá de forma notable en la forma en la que procesamos los estímulos que se nos presentan.

Desde la cognición social se plantea que la percepción de personas es el resultado de dos procesos básicos: la categorización y la individualización (Brewer, 1988; Fiske y Neuberg, 1990). A continuación expondremos algunos modelos que han tratado de explicar en qué momento y con qué características se llevan a cabo estos dos procesos básicos.

6. Modelos de percepción social

Hasta ahora, hemos comentado algunos de la amplia muestra de trabajos existentes en los que se demuestra la importancia de las caras para desenvolvernos en el mundo social. Todos estos trabajos parten de un marco teórico consolidado por años de investigación y que se extiende en la actualidad en función de los avances en las tecnologías o medios a la disposición de los investigadores.

La mayor parte de los modelos involucran tanto procesos perceptuales, y cognitivos, como motivacionales y sociales, así como diferenciar entre los mecanismos involucrados no solo en el reconocimiento facial, sino en el análisis e interpretación de las expresiones emocionales, entre otros aspectos variables del rostro como la mirada. Pero sin duda uno de los objetivos de todos ellos consiste en determinar si los individuos se perciben como individuos o como miembros de categorías, así como la forma en que estos dos procesos se llevan a cabo para dar lugar a una impresión global coherente sobre las personas percibidas.

Es importante clarificar, que mientras que los procesos de *categorización* implican un percepción del individuo basada en su categoría de pertenencia, los procesos de *individualización*, por su parte, dan más importancia a las características específicas e idiosincrásicas de los individuos.

A continuación presentamos dos de los modelos que han dado lugar a mayor investigación en percepción social, y que presentan diferentes posturas acerca de la relación entre los procesos de individualización y la categorización en la percepción de

personas.

6.1 El Modelo Continuo en la Formación de Impresiones (Fiske y Neuberg, 1990)

Se trata de un modelo secuencial en el que la percepción se define por un continúo en el que los extremos (individualización y categorización) están determinados por la cantidad de información que el perceptor dispone sobre las personas percibidas. Así, cuanta más información *idiosincrásica* posea el perceptor sobre la persona percibida podrá crear impresiones que le permitan diferenciarla más de los demás, y por tanto en mayor medida se acercará al extremo de la *individualización*. Si por el contrario, la información que posee el perceptor hace referencia exclusivamente a características basadas en la categoría de pertenencia, indudablemente el extremo de *categorización* será el más próximo.

Este modelo postula que la fase inicial en el proceso perceptivo, de naturaleza automática y que menor esfuerzo cognitivo requiere es la categorización en función de sus características más sobresalientes. Esas características que se utilizan como claves sociales como acabamos de ver en el apartado anterior, pueden hacer referencia tanto a aspecto físico, como el color de la piel, su edad, o incluso su comportamiento. Una vez que la persona ha sido categorizada, la categoría trabaja rápido y eficientemente, haciendo accesible toda la información afectiva, cognitiva y conductual.

Que el perceptor vaya más allá de la categoría inicialmente activada o no dependerá de sumotivación para formarse una impresión más o menos compleja de la persona percibida y emplear los recursos cognitivos disponibles que tiene en esta labor. El modelo contempla dos factores que tienen un papel importante en la relación entre la categorización y la individualización: la atención y la motivación. La atención sería necesaria para conocer nuevas características de la persona percibida, lo que proporcionaría la información necesaria para recategorizarla en otra categoría social diferente, o incluso individualizarla. Así, este modelo propone la siguiente secuencia en el proceso de percepción de personas: categorización-recategorización-individualización (véase Figura 1).

Por su parte entre las motivaciones más importantes que se consideran a la hora de seguir adelante e ir más allá de esa categorización social se contempla el nivel de dependencia entre la persona percibida y el perceptor, el objetivo de la impresión, etc.

Si al realizar la primera categorización, el perceptor considera que la

información que posee no se ajusta a la categoría que acaba de formar, puede reenterpretar la información que ha procesado lo que le proporcionaría una segunda categoría para volver a recategorizarla si fuese necesario. La recategorización se puede llevar a cabo de diferentes modos, se puede acceder a subcategorías, o subtipos o incluso volver a considerar la categoría inicial (e.g., Eckes, 1994; para una revisión, véase Fiske 1998). Cuando el perceptor determina que la persona se ajusta a la categoría activada, responde de modo que infiere que la persona percibida refleja todas o casi todas las características distintivas de la categoría. Sin embargo, si el perceptor no puede confirmar ni la categoría inicial ni la recategorización entonces, solamente si continúa motivado y posee recursos atencionales suficientes para ello, podría analizar a la persona atributo a atributo, y formarse una impresión individualizada de la misma.

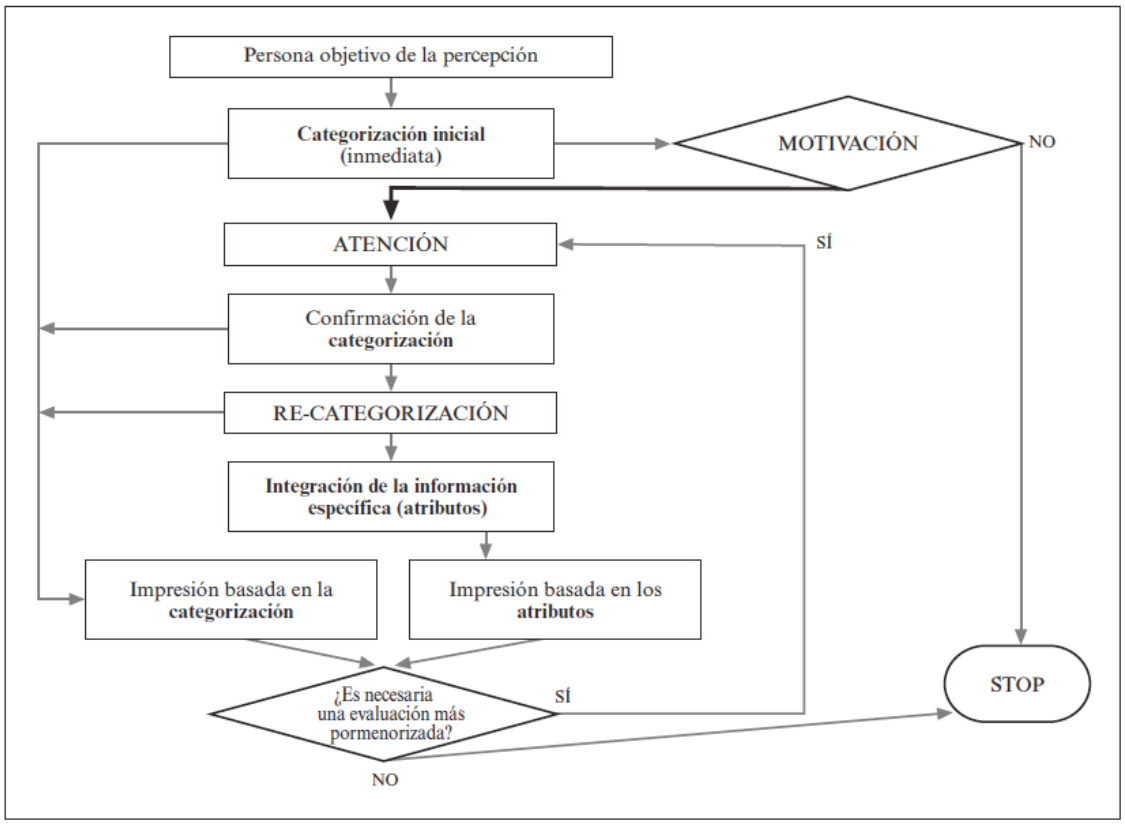

Figura 1: Representación esquemática del modelo del continuo de la formación de impresiones (adaptado de Fiske y Neuberg, 1990).

6.2. Modelo de procesamiento dual (Brewer, 1988)

Al igual que el modelo propuesto por Fiske y Neuberg (1990), este modelo se esfuerza por identificar las distintas formas que puede adoptar la percepción de personas: individualización o categorización. Ambos modelos se diferencian en la posiciones tomadas en la relación entre los procesos de categorización e individualización. Así, aunque ambos modelos están de acuerdo en que la primera fase automática en el proceso perceptivo es la categorización, el Modelo Continuo da prioridad a la categorización, y plantea la individualización como un proceso posterior y más controlado que el anterior. El Modelo de Procesamiento Dual, en cambio, asume que los perceptores implícitamente eligen entre categorizar (proceso de arriba-a-abajo) o individualizar (de abajo a arriba). Concretamente, desde este modelo se considera que la elección entre el tipo de procesamiento que se llevará a cabo tiene lugar relativamente pronto en la secuencia de procesamiento de la información en la percepción de personas (Figura 2). Otras de las diferencias con el Modelo Continuo es que en este caso se plantea la posibilidad de que ambos tipos de procesamiento se produzcan en paralelo, pero desde el mismo se advierte que el resultado no será la integración de ambas interpretaciones del objetivo de la percepción, sino dos posibles representaciones del mismo.

En el proceso de individualización, el perceptor recupera su conocimiento previo para hacer inferencias directamente sobre los atributos que le ayuden a saber qué tipo de persona es la que acaba de encontrarse. La representación individualizada resultante será más o menos compleja en función de la cantidad de información que ha sido atendida e integrada en la impresión.

Por su parte, a lo largo del proceso de categorización se activa la información relevante categórica o estereotípica mediante un procedimiento que consiste en comprobar qué características son las que coinciden con el prototipo de la categoría más relevante activada.

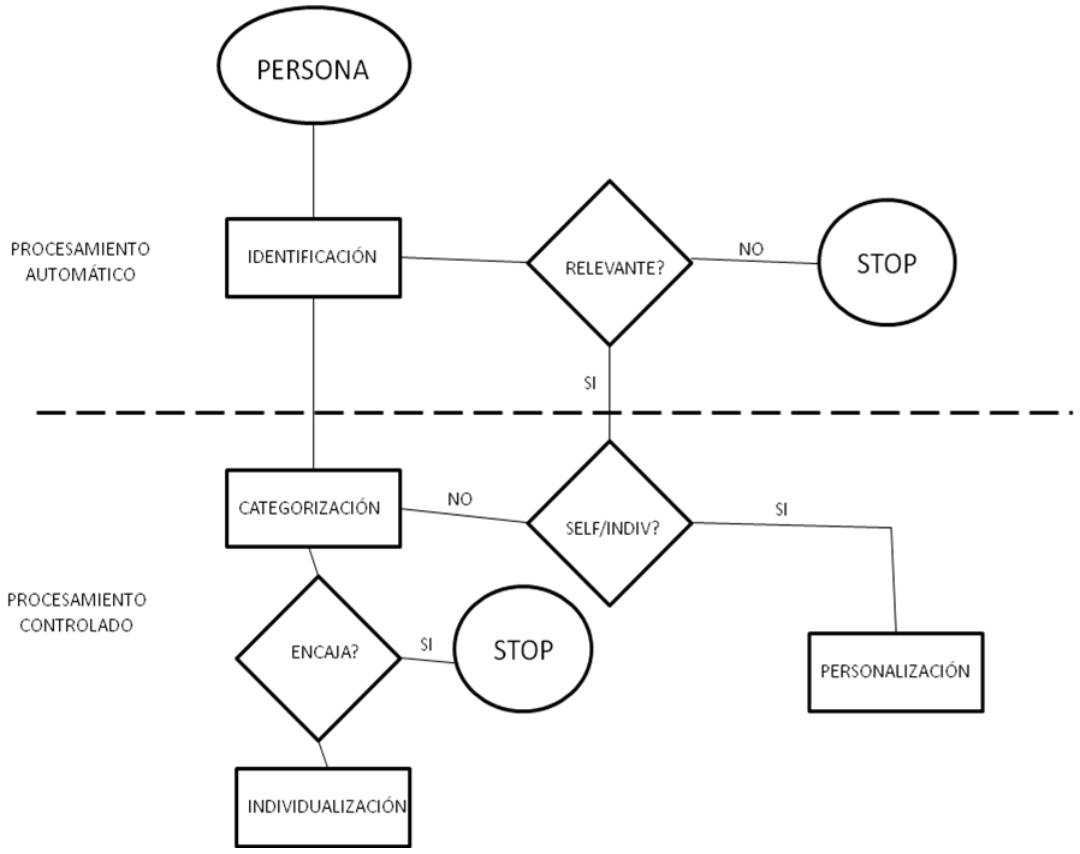

Figura 2: Representación esquemática del modelo de procesamiento dual. Extraído de Brewer (1988; p.5). Copyright 1988 Lawrence Erlbaum Associates.

Como ambos modelos advierten existen una serie de factores moduladores del en la percepción de personas. Mientras que el modelo de Fiske y Neuberg (1990) propone que estos moduladores desplazan la percepción de un extremo al otro del continuo, el modelo de Brewer (1988), sugiere la existencia de dos tipos de procesamientos.

7. Algunos moduladores en los procesos de percepción de personas

En la línea de los modelos de percepción de personas que acabamos de presentar, la mayoría de las investigaciones clásicas en el ámbito de la percepción social asumen el carácter automático de los procesos de categorización. Sin embargo, trabajos recientes cuestionan la automaticidad de este proceso (Gilbert y Hixon, 1991; Macrae y cols., 1997, Bargh, 1999; Blair, 2002). En este apartado pretendemos mostrar algunas de las variables que pueden intervenir en este sentido.

7.1 Familiaridad – Tipicidad de los estímulos

Diversas líneas de investigación sugieren que cuando las personas encuentran un objeto o situación que se ha presentado previamente, tienden a involucrarse en un procesamiento de bajo nivel, que requiere poco esfuerzo y por tanto prestan menos atención a esos objetos o situaciones (Garcia-Marques y Mackie, 2000, 2001; Johnston y Hawley, 1994; Johnston, Hawley, Plewe, Elliott, y DeWitt, 1990; Sherman, Lee, Bessenoff, y Frost, 1998; von Hippel, Jonides, Hildont, y Narayan, 1993). Información previamente codificada deja consigo trazos de memoria que se reactivan posteriormente. Cuando nueva información se puede emparejar con estos trazos de memoria (p.e. es familiar), se puede procesar fluidamente y sin esfuerzo, permitiendo al perceptor destinar su atención a la codificación de la información inesperada y novedosa. En este sentido en ausencia de factores motivacionales, la familiaridad potencia el pensamiento de tipo heurístico.

De acuerdo a estos modelos jerarquizados, el nivel "básico" de categorización corresponde al nivel óptimo de diferenciación entre entidades dentro de una categoría. Es el nivel, dentro de la estructura jerarquizada de cada categoría, al que se accede de forma más rápida, pudiendo variar éste en función de la experiencia del participante. Además el nivel básico, maximiza tanto la clave de validez (diferenciación) entre categorías y el parecido (similitud) entre los miembros u objetos pertenecientes a una misma categoría, maximizando la economía cognitiva durante el procesamiento a este nivel (Johnson, y Boyes-Braem, 1976; Rosch, Mervis, Gray,). En el caso de la percepción de personas, el nivel básico en ocasiones puede situarse al nivel de las categorías sociales, debido a que éstas proporcionan la máxima información sobre la persona percibida con el mínimo esfuerzo (véase, Bodenhausen y Macrae, 1998; Macrae y Bodenhausen, 2000; Quinn, Macrae, y bodenhausen, 2003). Así especialmente cuando las personas no son familiares para el perceptor, percibirlas de acuerdo a la categoría social a la que pertenecen proporciona una gran cantidad de información sin la necesidad de gran cantidad de recursos. Sin embargo, cuando los individuos son familiares, podemos acceder rápidamente a la información almacenada sobre ellas y seguramente el nivel básico de categorización en este caso será subordinado (Tanaka y Taylor, 1991). Familiaridad y experiencia son dos factores que guardan cierta relación, haciendo hacen referencia a la cantidad de conocimiento previo

que una persona posee sobre diferentes objetos (incluídas las personas). En esta dirección algunos estudios han mostrado la tendencia de las personas a identificar a personas famosas (y por tanto les son familiares) por su nombre -nivel subordinado (e.g. Barak Obama) en lugar de su categoría de género –nivel superordinado (hombre) (Tanaka, 1991, 2001). De igual modo ocurría con personas expertas en animales, a los que se les presentaban distintas razas/especies de perros y pájaros, a los que les resultaba más fácil identificar la raza/especie concreta, ("terrier"/"cardenal") que su categoría de pertenencia (perro/gato).

7.2 Contexto

Como comentábamos al principio de esta introducción entendemos contexto como el entorno físico o la situación donde tiene lugar un acontecimiento. Así, en nuestro diseño experimental, las rostros se convertirán en un tipo especial de contextos al ser los marcos de referencia donde se presenta la tarea que debe realizar el participante. Por tanto, si el participante determina que dichos rostros son relevantes para la tarea, los procesará de forma más detalla que si por el contrario piensa que son irrelevantes para la misma.

Hay algunos estudios que muestran el papel del contexto en los procesos de memoria (véase Smith y Vela, 2001 para un meta-análisis) y percepción social. Por ejemplo en una reciente investigación llevada a cabo por Jones y Russell (2010) se utilizó el procedimiento de identificación de un arma (Shooter task- Payne, 2001) en el que la tarea consiste en identificar la presentación de un arma o una herramienta precedida por un rostro de una persona negra o blanca. Los resultados de este estudio mostraron que en los ensayos en los que se presentaban personas negras, se reducía el tiempo de reacción en la detección del arma frente a la herramienta, mientras que esto no ocuría cuando la clave era el rostro de una persona blanca.

Por ejemplo, en un trabajo llevado a cabo por Wittenbrink, Judd y Park (2001a) se manipuló el contexto en el que aparecía una persona blanca o negra, por medio de las imágenes utilizadas como primes (utilizando como fondo el interior de una inglesia –contexto positivo- o una pared cubierta de graffitis –contexto negativo-). Los participantes tenían como objetivo, categorizar los adjetivos presentados como objetivos en positivos o negativos. Los resultados de dicha investigación mostraron una facilitación para categorizar los adjetivos como negativos previa presentación de un contexto no congruente con la categoría social presentada (e.g. persona negra en el

contexto de una iglesia).

La muestra de investigaciones presentada arriba pone de manifiesto la relación existente entre estereotipos y categorías. Para ello nos gustaría hacer un pequeño inciso para aclarar esta temática antes de continuar con el siguiente de los moduladores de la caetgorización.

Los estereotipos son representaciones cognitivas de categorías de perosnas junto con los atributos que tienen asociadas dichas categorías. Son el resultado de un funcionamiento cognitivo que permite llegar a predicciones sobre la conducta futura de los demás. Están pensadas como medida para economizar recursos cognitivos (Macrae, Milne, y Bodenhausen, 1994). La activación de un estereotipo, entendida como el proceso por el que dicho estereotipo es recuperado de memoria, puede distinguirse de la aplicación de un estereotipo, cuando un estereotipo influencia un pensamiento o conducta hacia un miembro del grupo estereotipado. Ambos procesos pueden llevarse a cabo de forma automática. Ya que estereotipos son atributos asociados con categorias, al activar una determinada categoría conlleva la consecuente activación del estereotipo (Dovidio, Evans, y Tyler, 1986) proporcionando un procesamiento aventajado de la información relevante para el estereotipo, o dicho de otra forma, aquella información que ratifica el estereotipo (Macrae, Stangor, y Milne, 1994).

7.3. Atención selectiva

El mundo es un contexto complejo a procesar repleto de información referente a diferentes dominios que necesita ser almacenada,. Nuestro cerebro debe ser capaz de seleccionar de forma selectiva aquella información que pueda ser relevante para la tarea que nos ocupa. Por ejemplo, debemos ser capaces de limitar el procesamiento de un conjunto de estímulos que se presenten en un mismo contexto y distinguir aquel que sea nuestro objetivo, que nos facilite una toma de decisión, que nos ayude a recuperar un recuerdo que andábamos buscando, o que facilite la tarea que perseguimos.

Cuando el objeto a percibir se trata de personas, se ha demostrado la automaticidad con la que la atención es dirigida a las características identificatorias de categoría (p.e. género) y por tanto siendo procesadas de forma muy temprana en base a un procesamiento de abajo-a-arriba (dirigido por los estímulos). Sin embargo, recientes investigaciones han mostrado que procesos dirigidos por las metas o características ambientas (contexto) –procesaiento de arriba-a-abajo, pueden producir la maleabilidad

de este procesamiento automático en percepción social (ver Blair, 2002 para una revisión) e influir en la categorización. Algunas de estas investigaciones han sugerido que un procesamiento dirigido por las metas y las características contextuales puede ocurrir rápidamente e influenciar la categorización (procesamiento de arriba-a-abajo). Para demostrar qué tipo de procesamiento dirigía la percepción de caras, Ito y Urland (2003) llevaron a cabo una investigación en la que utilizaron un procedimiento en el que presentaban a los participantes secuencias de 5 rostros de personas, cada uno durante 1000 ms. La tarea de los participantes era categorizar por sexo las caras presentadas, o en función del color de la piel, blancas o negras. A los participantes se les presentaban 4 bloques en los que se incluían imágenes que en su mayoría pertenecían a una única categoría (p.e., Hombres Blancos). En algunos ensayos, las 5 imágenes pertenecían a esa categoría. En otros ensayos, una de las imágenes pertenecía a uno de las otras categorías (p.e., Mujer Blanca, Hombre Negro, o Mujer Negra). Recogían medidas de Potenciales Evocados durante la presentación de cada estimulo individual dentro de cada secuencia de 5 estímulos. Curiosametne, los autores definían el estímulo no objetivo, como *contexto* (es decir, si debían responder a la raza, el sexo de la persona se consideraba como contexto). A lo largo del experimento, cada categoría funcionaba tanto de contexto como de objetivo el mismo número de veces. De forma específica, los estímulos objetivos podían ser: a) de la misma raza y género que el contexto (p.e., un Hombre Blanco presentado con Hombres Blancos como contexto), b) del mismo género pero diferente raza que el contexto (p.e., un Hombre Negro presentado con un Hombre blanco como contexto) c) de la misma raza pero diferente género que el contexto (p.e., Mujer Blanca presentada con un Hombre Blanco), d) tanto la raza como el género diferentes que el contexto (p.e., una Mujer Blanca presentada con un Hombre Negro como contexto). Los resultados mostraron que la atención se dirigía hacia las claves de raza y género en los estadios tempranos del procesamiento. Los efectos de la raza aparecían en primer lugar, con una mayor amplitud de los potenciales N100 y P200 para las caras negras que las blancas. Por su parte, los efectos del género aparecían en el P200, con mayor respuesta para los hombres que para las mujeres. De forma inversa, se encontró una mayor respuesta para las mujeres en el N200. De forma interesante, no apareció ningún efecto del tipo de tarea de categorización o de la relación entre el estímulo objetivo y el contexto precedente en estos componentes tempranos. Esto parece indicar que en etapas tempranas del procesamiento visual, los efectos pueden ser atribuidos a las características específicas de los estímulos, independientemente de la

tarea que el participante tiene que realizar (su objetivo) e independientemente de la relación entre el estímulo previo y el actual. Sin embargo, el componente P300 mostró una mayor amplitud cuando los estímulos diferían del contexto previo, a través de la dimensión relevante para la tarea, reflejando por tanto un procesamiento de actualización del contexto que ocurría en respuesta a un tipo de atención más explícita hacia las características del estímulo que son relevantes para la tarea. Consistente con esto, el componente P300 era mayor para el estímulo objetivo perteneciente a una categoría que difería del contexto en la dimensión relevante para la tarea que cuando ambos estímulos (objetivo y contexto) coincidían. En resumen, se podría afirmar que el componente P300 es sensible a juicios sobre categorías sociales explícitas e implícitas.

Es importante mencionar que mientras que el procesamiento categórico de una cara parece ser de tipo automático y en cierto modo requiere poca atención o incluso puede ser inconsciente (apareciendo incluso a los 100 ms tras ser presentados con un rostro), el reconocimiento de la identidad parece necesitar de una codificación configuracional u holística de la información (véase Maurer, Le Grand, y Mondloch, 2002, para una revisión). Sin embargo, en el procesamiento de la identidad de la cara, las investigaciones no están claras a cerca de la necesidad de recursos atencionales. Estudios como los de Boutet, Gentes-Hawn y Chaudhuri, 2002, parecen indicar que poca o ninguna atención es necesaria para codificar una representación holística de una cara. Para mostrarlo, utilizaron en sus estudios una variante del "composite effect" (caras compuestas; Young, Hellawell, y Hay, 1987), en el que mostraban a los participantes un conjunto de caras compuestas que podrían estar "alineadas" (cuando tanto las partes de arriba y de debajo del rostro de dos caras diferentes se unían para formar una única cara, lo que dificulta el reconocimiento de la parte superior) o "desalineadas" (cuando la parte de arriba y de bajo están ligeramente desplazadas, lo que facilita el reconocimiento de la parte superior). Los participantes, previa presentación de las caras compuestas, realizaban una tarea en las que se presentaban de forma simultánea, imágenes superpuestas de caras y casas y se les pedía que o bien atendieran a las caras o no atendieran a las caras. En la subsequente presentación de las caras compuestas, mostró un mejor reconocimiento para las caras que se presentaban "desalineadas", independientemente de si en la fase anterior se había atendido a ellas o ignorado. Tal resultado permitió a Boutet y cols. concluir que la identidad de la cara puede ser codificada con escasa o nula atención. Por el contrario, como hemos mencionado anteriormente, algunos estudios han demostrado que se requiere atención

para formar una representación holística de la identidad. Palermo y Rhodes (2002) evaluaron la codificación holística de las caras a través de un procedimiento comparativo del "todo vs. partes" en el que se les presentaba a los participantes una cara y posteriormente se les pedía que reconocieran las partes del rostro (i.e., ojos, nariz y boca) a través de una respuesta forzada en la que se les daban como opciones dos "partes sueltas" (p.e., nariz 1 versus nariz 2) o dos "caras enteras" que eran idénticas excepto por las características en cuestión (p.e., nariz 1 versus nariz 2) (p.e. Tanaka, Kay, Grinnell, Stansfield, y Szechter, 1998). Los resultados mostraron que el reconocimiento de las partes de la cara era superior cuando las partes se presentaban en el contexto de la "cara entera" en comparación con las "partes sueltas", sugiriendo que la cara parece estar representada de forma holística a diferencia de otro tipo de estimulos (Tanaka y Farah, 1993).

En una tarea diferente, Palarmo y Rhodes (2002) presentaron una cara central y dos caras flanqueándola durante un breve periodo de tiempo. Su objetivo era medir la codificación holística de la cara central con la tarea "todo vs. partes" antes mencionada. Aquellos participantes que fueron instruidos a ignorar las caras laterales mostraron un procesamiento más holístico (en línea con los resultados mostrados arriba, mejor ejecución en la condición de "caras enteras" que en la de "partes sueltas", mientras que aquellos participantes a los que se les pidió que decidieran si las caras laterales eran iguales que la central, eran incapaces de codificar la cara holísticamente. Estos resultados sugieren que la codificación de la identidad facial demanda recursos atencionales (véase Reinitz, Morrissey, y Demb, 1994 para conclusiones similares).

La familiaridad puede ser crítica en el procesamiento de codificación de la información de identidad facial. En esta línea Jackson y Raymond (2006) encontraron ceguera atencional[7] para caras no familiares pero no para caras muy familiares. Del mismo modo, Buttle y Raymond, 2003, mostraron que cambios entre dos caras eran fáciles de detectar cuando una de ellas era famosa.

[7] Efecto que se produce por la sucesión rápida y muy próxima de dos estímulos objetivos, provocando que el segundo de ellos no sea percibido, presumiblemente por no existir recursos atencionales disponibles. (Raymond, Shapiro y Arnell, 1992)

En conclusión a lo largo de esta introducción hemos querido acercarnos a los mecanismos a la base del procesamiento de la información que se encuentra en contextos tanto ambientales como sociales (personas). Hemos encontrado un objetivo común en disciplinas aparentemente tan dispares como son la psicología cognitiva y la experimental. Ambas están interesadas en el estudio de aquellos mecanismos que nos ayuden a comprender el mundo y más concretamente las personas que nos rodean de la forma más rápida y sencilla posible. Diferenciando la información relevante de la no relevante. A tal fin, proponen estrategias de categorización que pueden ser moduladas por diferentes factores. Con este trabajo de tesis, intentamos aunar ambas disciplinas para intentar profundizar en el estudio de la Atención y Generación y Aplicación de estereotipos.

MOTIVATION
&
OVIERVIEW OF RESEARCH

MOTIVATION & OVERVIEW OF THE RESEARCH

One of the most important goals of the current research was to explore how human faces could serve as context for the allocation of attentional control. Our research was based on previous investigation on attentional control, which shows that the allocation of attentional control, traditionally conceived as effortful and conscious but flexible, can be also applied automatically in response to contextual cues, that are task irrelevant but consistently associated to different needs of attentional control. Importantly, we wanted to explore whether human faces used as contexts (task irrelevant) would be processed in a category-base or an identity-base fashion. Consequently, another important goal of the current studies was to acquire a better understanding of the categorization-individuation processes underlying social perception, by creating a procedure, which allowed us to investigate processes of stereotype formation and stereotype use. Specifically, we developed a procedure that associates different faces to distinct needs of attentional control, which allowed the measurement of the categorical processing of faces, and the categorical utilization of attentional control.

Attention is a cognitive process that can adapt flexibly in response to changes in the environment. This flexibility has been traditionally considered to be possible at the expense of cognitive effort and conscious resources. However, the ability to adaptively and rapidly control attention is common in daily life situations. Nowadays the underlying mechanisms of this automatic allocation of attentional control are starting to become better understood through laboratory experiments, in which it is shown that people can automatically apply more or less control in response to environmental cues. Yet, the nature of these cues is under debate; it is not clear whether the automatic adjustment occurs, i.e., more or less attentional control is automatically applied, depending on the specific items or stimuli to which participants have to respond to (item-specific approach, Jacoby, Lindsay, & Hessels, 2003), or to the contexts in which those stimuli appear (context-specific approach, Crump, Gong, & Milliken, 2006).

We wanted to shed light onto this debate. Being aware of the need of stimuli likely to result in fast categorization, we decided to use human faces because they have

been largely claimed to be processed automatically (Macrae, Quinn, & Mason, 2005; Martin & Macrae, 2007) and categorically at the same time (Bülthoff & Newell, 2004; Calder, Young, Perret, Etcoff, & Rowland, 1996; McKone, Martini, & Nakayama, 2001; Stevenage, 1998). This fast processing and categorization of faces would allow their use as context for fine adjustments in attentional control.

However research in the field points to evidence showing that some characteristic of the perceivers such as motivation (Macrae, Quinn, Mason & Quadflieg, 2005), attention (Ito & Urland, 2003), previous knowledge, (Murphy & Brownell, 1985) and familiarity (Blair, Judd, & Fallman, 2004; Livinston & Brewer, 2002; Maddox & Chase, 2004; Maddox & Gray, 2002, Tanaka, 2001, Tanaka & Taylor, 1991) may modulate the perception of faces, which will determine its used as context. We wanted to test these possibilities by developing an implicit measure that allowed us to create a kind of new stereotype (taken in this thesis as an association between an attribute shared by a group of faces and a particular attribute or behavior, that is, the need for more or less attentional control). Furthermore, we had the goal to evaluate to what extend the novel learning about a group of people could be generalized to inconsistent members of the same group and to new people with whom participants have no previous experience.

In order to study these issues we carried out three experimental series aiming at investigating three main questions:

1.- Could faces (gender of the faces -Experimental series 1 and 3- and/or emotions- Experimental series 2) serve as a context for the allocation of attentional control? Will it be possible to learn to apply more or less attentional control depending on the social context (i.e. social categories to which these faces belong to) in which it has to be applied? By using some very similar emotions as context, we also wanted to explore whether it is not simply the physical features of the stimuli but the impression that the participants form from the faces with certain emotional expressions what generates the contextual allocation of control.

2.- As it is the case for stereotypes, may this allocation of control be generalized to inconsistent and/or novel faces of the group? (Experimental series 1, 2, and 3). This was very important from a social psychological perspective, as this generalization of the learning acquired regarding some people to other unknown peers who just share their category membership is the basis for social categorization and stereotyping (Tajfel, 1981).

3.- To what extent certain variable associated to the perceiver may modulate whether it is the group (categorization) or the individual (individuation) what is taken as context for the allocation of attentional control? In Experimental series 1 we tested perceivers' motivation to individuate vs. categorize the faces of people that served as context (manipulated by the instructions, Experiment 2). In Experimental series 3, we manipulated the participant' previous knowledge of the stimuli that were used as contexts. In Experiment 1a of this series, non-familiar faces (with which perceivers did not have previous knowledge) were used as context. In Experiment 1b, very distinctive non-social exemplars (i.e., animals and tools) were used with which participants were expected to be highly familiar. Finally, Experiment 2 of this series, used Spanish celebrities, and investigated the role of the participant' knowledge (familiarity) by using two different samples (Spaniards vs. Americans students; High vs. Low familiarized with the Spanish celebrities, respectively).

We carried out Experimental series 1 in order to test whether the gender of faces could be used as a context to apply more or less control, as previously shown with non-social attributes like location and shape (see, Crump et al. 2006, 2008, 2009). As shown in the introduction, Crump et al. proposed that the context-specific proportion congruency effect (PCE) reflects the learning of an association between a contextual cue and a proportion of congruency. As a result, more control is applied in a context associated to Low proportion congruent (e.g. an specific group of human faces displayed simultaneously with many incongruent and less congruent trials, LPC) than in a context associated to High proportion congruent (HPC) trials. Therefore, reduced conflict/congruency effect (RT and error rates for Incongruent – Congruent trials) is found for LPC contexts than for HPC contexts. The process underlying the context-specific PCE effect acts rapidly and involuntarily, that is, participants seem to be unaware of the proportion manipulation, which make this procedure an excellent implicit tool for the study of stereotype formation and application.

Since human faces seem to capture our attention in different ways, either focusing on the characteristics typical of the category–*categorizing people*, or by focusing on the traits diagnostic of the identity of the faces –*individuating people*, they seem to constitute great contextual cues in order to modulate the allocation of attention control. With this idea in mind, we used a *flanker task*, where participants had to discriminate the direction of the middle arrow of a five arrows string. The target is the

central arrow, which could point, in the same –congruent condition- or opposite –incongruent condition- direction than the flanker arrows. The arrows were presented in the context of a face, and the proportion of congruent/incongruent trials associated to each gender context (male vs. female faces) was manipulated. That is, HPC trials could be associated with female faces (and then LPC trials should be associated with male faces), or the opposite. We expected, as formerly reported, that participants would apply more control associated to the gender context associated to LPC trials, and therefore a reduced conflict/congruency effect would be observed with them as compare to the complementary gender context associated to HPC trials, for which a larger conflict/congruency effect is expected. If that happens to be the case, we will be reporting a new example of the so-called context-specific PCE (from now, social-context specific proportion congruency effect – or social-context specific PCE-, due to its social nature).

Furthermore, in the ***Experimental series 1***, we created consistent and inconsistent members of each group in order to seek for what could be called stereotypic learning of the association between the proportion of congruency in the flanker task of a group of the same gender faces. In such a way, one of the members of each group was associated to the proportion of congruency associated to the other group. For instance, if the female group was associated to HPC, three female faces were associated to HPC trials (consistent faces) and one female face was associated to LPC trials (inconsistent face). The opposite proportions were associated to the male group. If participants apply the same control for consistent and inconsistent faces, this may imply that participants use the information of the social category, rather than the individual information (i.e., the proportion of congruency associated to each specific face) to apply control, and therefore, we could assume that they are creating and using a new stereotype about group members and behaving consequently. This result would show that participants are categorizing according to the gender of the stimuli. On the other hand, if participants apply specific amount of control to solve the *flanker task* as a function of the particular proportion of congruency associated to each face, we could assume that they are individuating each one and learning information about the specific face, not about the group in general. A final possibility will be that the eight faces are perceived as a one context in itself (i.e. as they are all humans) and therefore will be grouped in a single category. This last possibility will eliminate any chance to implicitly

perceive the congruency manipulation and therefore producing null results. If that was the case however it could be an indicator of a higher level of categorization of the items (i.e. superordinate, Rosch & Mervis, 1975). The first option would support a context-specific PCE (Jacoby et al, 2001), and a case of automatic social categorization, whereas the second will show the item specific proportion congruency effect, and a case of automatic individuation.

We also studied in this first Experimental series (Experiment 2), how people' motivation to treat others (either individuating or categorizing them) could modulate the application of control to perform the *flanker task*. We did that by manipulating explicitly the instructions gave to participants in order to perform the task. While half of the participants were instructed to pay attention to the gender of the faces used as context during the task, the remaining half were instructed to think individually about them. We hypothesize, according to previous findings (e.g. Brewer &Brown, 1998; Fiske & Neuberg, 1990; Hugenberg, et al. 2010; Macrae et al., 1997), that participants' motivation to either categorize or individuate will significantly affect the social-context-specific PCE.

In ***Experimental series 2*** we went further and aimed to explore whether participant' implicit impression extracted from similar or different facial expressions could be used as context, and also cue the allocation of attentional control. We had also the goal to replicate and generalize the results found in the first experimental series by using invariant properties of face perception (gender) to other variant or emotional features/states of the faces: facial expressions. It has largely been shown that cognition and emotion are interrelated processes. Some emotional stimuli capture more attention than other, due to their social relevance (Folk, Remington & Johnston, 1992). Therefore, it seemed interesting to evaluate to what extend facial expression of emotions were used as incidental context, and accordingly, may capture attention in a categorical or individual way, by using the same procedure developed in previous experimental series.

We conducted three experiments, comparing happy vs. angry expressions on the faces displayed (Experiment 1), true vs. false smiles (Experiment 2), and happy vs. sad emotional faces (Experiment 3). In doing so, we aimed to explore whether participant' impressions of the attributions made of emotional stimuli could underlie person categorization. We hypothesized that, if emotional categorization is a faster and implicit

process, as suggested by some emotional theorists (e.g., Calder, Young, Perret, Etcoff, & Rowland, 1996; Ekman & Friesen, 1975; Izard, 1971), then a social-context-specific PCE should be found for the stimuli presented, and participants will devote attentional control specifically to each picture. However, if participants' impressions and attributions modulate their face perception (let's say to approach or avoid an specific emotional target, or to trust differently some individuals,) then the social-context-specific PCE might not occur and an individuated perception of the emotional faces will be found.

In ***Experimental series 3*** we aimed to explore the role of previous knowledge (i.e., familiarity) in the categorization-individuation processes in person perception. Specifically, in order to evaluate how the social-context-specific effect PCE reported in the previous Experimental series could be modulated as a function of the perceiver' knowledge. In this case three different experiments using the same procedure reported in Experimental series 1 but changing the stimuli were run. Experiment 1a was a replication of Experiment 1 from the Experimental series 1 but using different face stimuli. In Experiment 1b pictures of common non-social stimuli, (tools and animals) which with participants were highly familiar with were employed as contexts in the flanker task. . In Experiment 2 faces of Spanish celebrities were employed as context for the attentional control task, and subsequently, the participants' familiarity toward them were evaluated. The Spanish sample compared to the American sample was expected to show higher familiarity with the pictures of Spaniards celebrities. . We expected for those non-familiar faces a replication of the social-context-specific PCE, as a measure of the underlying categorization processes. Therefore the same allocation of control for consistent and inconsistent faces within the category group was expected. However, for the non-social stimuli, as well as for participants highly familiarized with the celebrities that served as context in Experiment 3, a different degree of control according to the specific proportion of congruency associated with each individual stimulus was expected.

We have organized the following experimental series as separate articles with their own introduction and general discussion since they have been already published, or prepared to be submitted for publication to different journals (the first experimental series is in press in the *Journal of Experimental Psychology: General*). Thus, the

experiments, tables and figures are also numbered according to the article they belong to. However, to give coherence and unity to the current dissertation, we have unified the list of references and appendix and included them at the end.

Finally, an extended summary of the three experimental series and an integrative discussion of the results are presented in the General Discussion. We will discuss the results to these questions from cognitive (memory, attention and learning mechanism underlying the categorization-individuation process) and social psychology (social categorization and stereotype formation and application) approaches, together with some of the relevant theories of social perception.

CHAPTER 3

EXPERIMENTAL SERIES

EXPERIMENTAL SERIES 1

SOCIAL CATEGORIES AND ATTENIONAL CONTROL

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Social Categories as a Context for the Allocation of Attentional Control

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Abstract

Recent studies of cognitive control have highlighted the idea that context can rapidly cue the control of attention. The present study shows that faces can be quickly categorized on the basis of gender and these gender categories can be used as a contextual cue to allocate attentional control. Furthermore, the results reported here reveal processes implicated in the development and operation of implicit social stereotypes. Three of four faces from one gender group were associated with a high proportion of congruent trials in a flanker task, while three of four faces of the other gender group were associated with a low proportion of congruent trials. A single inconsistent face within each gender group was associated with the proportion congruency of the opposite gender group. A social context-specific proportion congruent effect (PCE) was observed (i.e., larger interference for the gender category associated with a high proportion of congruent trials), even for inconsistent members of the category. This effect is consistent with the view that a new implicit stereotype was created, linking gender with a specific proportion of congruency. In Experiment 2, the task goals modulated the use of the new created stereotype. Instructions to categorize vs. individuate the target faces respectively led participants to allocate attention either toward the category-diagnostic or the identity-diagnostic facial features. Furthermore, and in line with stereotyping research, under instructions to categorize faces this social-context-specific PCE generalized to new faces of the same gender group with whom participants did not have previous experience. These results link attention with social categorization processes.

Social categories as a context for the allocation of attentional control

Efficient behavior often requires flexible and dynamic responses to deal rapidly with changing social interactions. For example, imagine yourself in a situation where you have encountered your boss in a corridor while chatting with your best work mate. Would you be able to instantly change your casual and uninhibited behavior with your work mate for a more formal and serious tone? Of course you would. Cognitive control seems to allow information processing to vary adaptively rather than remaining rigid and inflexible (Verguts & Notebaert, 2008). Although casual observation suggests that people are good at applying control over social performance in a fast and flexible manner, social processes related to the modulation of cognitive control have not yet been the subjects of extensive research.

Outside social psychology, however, there has been increasing research interest in the fast and flexible control of performance. These studies have highlighted the role of contextual cues that dynamically modulate selective attention processes. The logic underlying these studies builds on a well-established procedure for studying cognitive control.

It has long been known that effects such as flanker interference and Stroop interference can be modulated by factors that affect top-down control over perceptual processing. In particular, when most of the trials in an experimental session contain distractors that are congruent (or compatible) with the target dimension (e.g., a left pointing arrow surrounded by left pointing arrows, or the word blue printed in blue), the distractor interference effect (i.e., the difference in performance between congruent and incongruent trials) is larger than when relatively few trials have congruent targets and distractors (Gratton, Coles, & Donchin, 1992; Lowe & Mitterer, 1982). When the relative proportions of congruent and incongruent trials are manipulated between blocks of trials, it follows that participants may detect the likelihood of congruency and voluntarily adapt processing of distractors in accordance with this likelihood, ensuring that distractor processing is attenuated when the likelihood of congruent trials is low.

Recent studies have built on this logic by examining whether distractor processing might be controlled rapidly in response to items (Jacoby, Lindsay & Hessels, 2003), or contexts in which items appear (Crump, Gong & Milliken, 2006), rather than deliberately in response to awareness of contingencies. For example, in a study by

Crump et al. (2006), participants were briefly presented with a color word prime at fixation, followed by a to-be-named colored-shape probe displayed randomly above or below fixation. Probes presented in one location were more likely (75%) to be congruent than probes presented in the other location (25%). The random presentation of the probes in the two locations ensured that participants were unable to anticipate the likelihood of probe congruency (which was 50% overall). Nonetheless, the Stroop effect was larger in the high-proportion-congruent location context than in the low-proportion-congruent location context. These results suggest that contextual cues, such as location in this case, can rapidly control the extent to which word reading affects color naming. A number of different perceptual dimensions have been used in similar studies of context-specific attentional control (Bugg, Jacoby, & Toth, 2008; Crump, Gong, & Milliken, 2006; Crump, Vaquero, & Milliken, 2008; Lehle & Hübner, 2008; Vietze & Wendt, 2009; Wendt & Kiesel, 2011).

An important issue in this literature is whether context-specific PCE truly reflect the allocation of varying amounts of control as a function of the specific proportion congruency context, or alternatively that they reflect a form of specific stimulus-response associative learning (Schmidt & Besner, 2008). This issue has been addressed in two different ways in recent studies (Bugg, Jacoby, & Chanani, 2011; Crump & Milliken, 2009). First, Crump et al. demonstrated that the association between proportion congruent and a context learned with one set of items transfers and affects the congruency effect measured for another set of items for which proportion congruency is not manipulated. Second, Bugg et al. demonstrated that the association between proportion congruent and one set of items transfers to another set of categorically related items with which the participant has had to that point no experience. Together, these results indeed suggest that attentional control can be allocated flexibly in response to rapidly processed contextual cues.

If the allocation of attentional control depends on the fast categorization of a context as either demanding or not demanding control, this fast categorization is likely to occur automatically on the basis of salient categorical features. Although such fast categorization processes are likely to occur in a wide range of contexts in which people have high levels of perceptual expertise, social contexts are one arena in which they have been shown to be very frequent (e.g. Brewer, 1988; Fiske & Neuberg, 1990; Cuddy, Fiske, & Glick, 2004; Nelson, 2005; Kawakami, Dion, & Dovidio, 1998). Yet,

to our knowledge no prior study has used social stimuli, such as human faces, as cues for the allocation of attentional control. Human faces might well be particularly good cues for attentional control, as they offer valuable information to perceivers, and are crucial to social interactions from birth onward (Johnson & Morton, 1991). With this idea in mind, one of the purposes of the current study was to examine whether social stimuli (i.e., human faces) might serve as contextual cues for rapid adjustment of attentional control.

Attention and Social Categorization

Both variant (e.g., emotional expression, gaze direction) and invariant (e.g., sex, age) features of person knowledge can be extracted from facial cues (Bruce & Young, 1986; Burton, Bruce, & Johnston, 1990; Tarr & Gauthier, 2000). These cues are crucial for people's understanding of others, and give perceivers information about individuals and their group membership. Contemporary models of social perception and face processing study the conditions under which person construal is based on unique entities (i.e., individual identities) rather than on social categories (Brewer, 1988; Bruce & Young, 1986; Fiske & Neuberg, 1990; Hugenberg, Young, Bernstein, & Sacco, 2010, Macrae & Bodenhausen, 2001). Whereas categorization requires attention to facial characteristics diagnostic of category membership, individualization requires attention to facial characteristics that are identity diagnostic (Hugenberg et al., 2010).

Research in this area demonstrates that, in general, category-based perception plays a more prominent role in person construal (Cloutier, Mason, & Macrae, 2005) than individual-based perception. People readily perceive the gender, ethnicity, and age of a briefly presented face (Fiske & Neuberg, 1990; Haxby, Hoffman, & Gobbini, 2000; Parkinson, 2005; Zebrowitz & Montepare, 2008). Intriguingly, once a face has been categorized as belonging to a certain group, that social categorization can in turn influence the perception of the face (e.g., Corneille, Huart, Becquart, & Bredart, 2004; Huart, Corneille, & Becquart, 2005) and consequently behavior toward the individual. Furthermore, once a social category is activated, it is used to rapidly and efficiently perceive new members of the group (Le Pelley et al, 2010), even when these group members possess category-inconsistent traits (Fiske, Lin, & Neuberg, 1999; Hastie, 1980; Rothbart, Evans, & Fulero, 1979). There is also evidence, however, that

individuation is dependent on the availability of attentional resources (Gilbert & Hixon, 1991), people's processing goals (Macrae et al., 1997), prejudice level (Lepore & Brown, 1997), contextual variables (Wittenbrink, Judd, & Park, 2001), and other moderators.

One of the factors that most theorists agree can trigger social categorization is attentional focus on category-relevant knowledge (e.g., Cloutier, Mason, & Macrae, 2005; Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; McGarty, Yzerbyt, & Spears, 2002). Manipulations that highlight this social dimension therefore should bias perception toward social categorization rather than individuation processes. Up to now, however, most studies along these lines analyzed the content of well-established cultural stereotypes and their effects (e.g. Fabes & Martin, 1991; Deaux & Lewis, 1984; Kashima, 2000; Krueger, 1996). Few of these studies investigated the processes through which new stereotypes are developed, maintained, and efficiently applied to consistent, inconsistent and new members of the category. Therefore, an important goal of the present research was to investigate the processes associated with the creation and subsequent use of implicit stereotypes. Here we consider stereotypes in the broad sense as involving an association between a social category and particular attributes, characteristics, and/or behaviors (Hilton & von Hippel, 1996). In the current study we used gender as the social category and associated gender with a particular proportion of congruency (the category associated attribute). We were interested specifically in whether gender of a face can be used as a contextual cue to control attention by establishing new implicit associations between the gender category and the need for attentional control (varied by manipulating proportion congruent, Experiment 1). Furthermore, we explored whether, as is the case for well-established stereotypes, this social-context controlled attention will generalize to group members with whom participants had category-inconsistent experience, and to new group members with whom they had no experience (Experiment 2). An additional goal of the second experiment was to investigate whether these social categorization processes are sensitive to instructions to attend to individual vs. category-related features of the faces.

Experiment 1

A Flanker task was used to measure attentional control. The flanker stimulus on each trial was presented in the context of a face, and gender of that face served as a contextual cue; male faces were associated with a high proportion of congruent trials (HPC), while female faces were associated with a low proportion of congruent trials (LPC), or vice versa. In line with prior studies (e.g., Bugg, Jacoby & Toth, 2008; Crump et al., 2006), larger congruency effects in the flanker task were predicted to occur for the HPC context than for the LPC context.

Furthermore, we created consistent and inconsistent category members within each of these two gender contexts. Thus, three faces of one category (e.g., men) were associated with a high proportion of congruent trials (the consistent faces), whereas a fourth face of the same category was associated with a low proportion of congruent trials (the inconsistent face), and vice versa for the other group. The key empirical issue concerned whether the predicted larger congruency effect for the HPC gender context would be specific to the consistent faces, or instead would generalize to the inconsistent face of the same gender. This empirical issue has important conceptual implications within the domains of both cognitive control and categorization processes.

Within the domain of cognitive control, generalization of the proportion congruency effect to the inconsistent face would contradict any account of the effect that hinges strictly on item-specific learning processes. Indeed, item frequency within a class of items is often confounded with proportion congruent for that class of items, which makes it difficult to discern whether proportion congruent effects reflect adjustments in cognitive control in response to items of a particular class, or stimulus-response learning that speeds responses to items that occur with a particularly high frequency (Schmidt & Besner, 2008). Generalization of the proportion congruency effect here to the inconsistent face would constitute one of a small number of context-specific control effects that are not subject to an item-specific learning interpretation (see also Bugg, Jacoby & Chanani, 2011; Crump & Milliken, 2009).

Within the domain of social categorization, generalization of the proportion congruency effect to the inconsistent face would implicate the creation of a new implicit stereotype, as well as its application to other members of the same category. Again, the

sense in which we use the term stereotype here is broad, implying only that participants may learn an association between a social category (i.e., gender) and a particular attribute (i.e., proportion congruent) that is typical of that category (Hilton & von Hippel, 1996). Such a result would align well with the idea that social categorization plays a prominent role in person perception; even when inconsistent members within the category are encountered (e.g., Brewer, 1988; Fiske & Neuberg, 1990). Indeed, it would serve as strong evidence that the mere perception of a social context (i.e., gender categories) can in principle trigger an attentional response that modulates relatively early processing in that context (i.e., processing subject to selective attention).

Method

Participants

Thirty undergraduate students (15 women, mean age 23 years) participated in exchange for course credit. All participants reported normal or corrected-to-normal vision and hearing, and were naïve to the purpose of the experiment.

Apparatus, Stimuli and Procedure

Stimulus presentation, timing, and data collection were controlled using the E-prime 2.0 software package run on standard Pentium 4 PCs. Stimuli were presented on a 17" computer screen, and consisted of full color photographs (taken from the NimStim Set of Facial Expressions: MacArthur Foundation Research Network on Early Experience and Brain Development; http://www.macbrain.org/resources.htm), each containing a face in an emotionally neutral state with a direct gaze. Eight different photographs were used, four portraying faces of young Caucasian men and four portraying faces of young Caucasian women.

The experiment used a modification of Eriksen's Flanker task (e.g. Eriksen & Eriksen, 1974). As can be seen in Figure 1, each trial consisted of a 200 ms fixation cross followed by the presentation of a face looking straight ahead. After a 400 ms interval, five arrows were presented above or below the face for 2000 ms or until response. The faces therefore were the context for the flanker task stimulus. In the congruent condition, all five arrows pointed in the same direction. In the incongruent condition, the central arrow and the four flanking distracters pointed in opposite directions. Participants were required to respond as quickly and accurately as possible to

the direction of the central arrow by pressing either the "Z" (left) or "M" (right) key. Participants were instructed to attend to the faces as they would be asked about them at the end of the experiment. The inter-stimulus interval (blank screen) was 1000 ms. Participants were allowed to rest between blocks. We used faces to create two types of contexts: the individual context, and the group context. These two contexts were associated with different proportions of congruency in the flanker task, which result in congruent/incongruent group conditions, and consistent/inconsistent individual face conditions. In particular, in the congruent group condition three faces of one category (e.g., men) were associated with a high proportion of congruent (HPC) trials (75% congruent, 25% incongruent). These were the consistent individual faces within this group. In contrast, one face from that same category was associated with a low proportion of congruent (LPC) trials (25% congruent, 75% incongruent, the inconsistent individual face). The opposite set of associations was established for the other gender group (i.e. incongruent group context). The group and the specific face associated to high or low proportion congruent was counterbalanced across participants. Also, faces assigned to Consistent and Inconsistent faces were randomly selected between participants (see Figure 2).

Note that the method described above ensured that there was no association between the direction of the target arrow (i.e., the response) and either the identity or gender of the face, nor was there an association between the direction of the flanker arrows and either the identity or gender of the face. Rather, the association that was introduced was limited to the relation between identity/gender of the face and congruency of the target/distractor dimensions of the flanker stimuli.

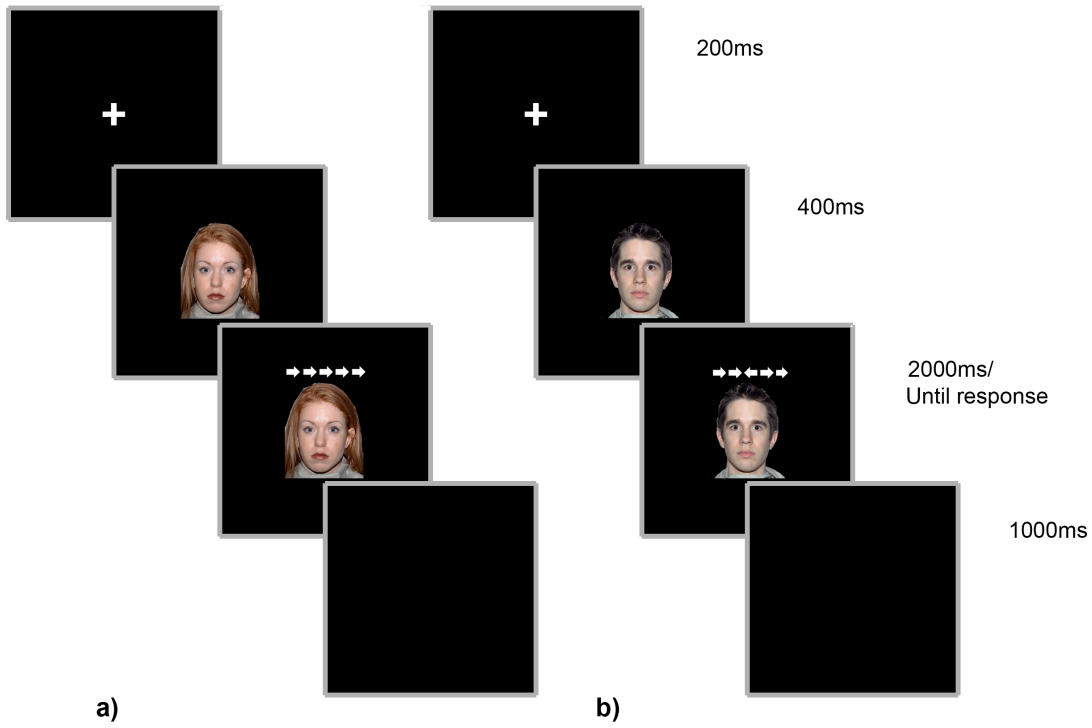

Figure1: Examples of time course of stimulus presentation in Experiment 1 and 2. Panel (a) illustrates a congruent flanker trial, with a female context face. Panel (b) illustrates an incongruent trial, with a male context face.

Design

The three within-subject variables were Group Congruency (High vs. Low proportion of congruency associated with the gender group), Individual Face Consistency (Consistent vs. Inconsistent proportion of congruency relative to the gender category) and Arrows Congruency (Congruent vs. Incongruent).

Participants performed one practice block of 16 trials followed by five experimental blocks of 128 trials each.

Results

Practice trials and the first block were not included in the analysis. Experimental trials with errors (2.1 %), or with response times (RT) shorter than 200 ms (anticipations) or longer than 1100 ms (lapses) (2.9%) were eliminated from the analyses. Mean RTs were computed, and submitted to a 2 (Group Congruency; HPC vs. LPC) x 2 (Individual Face Consistency; consistent vs. inconsistent with the group) x 2

(Arrows Congruency; Congruent vs. Incongruent) repeated measures ANOVA (see Table 1).

The analysis revealed a main effect of Arrows Congruency, $F(1,29) = 300.32$, $p < .001$. Responses on congruent trials (M = 539ms) were faster than on incongruent trials (M = 634 ms). Importantly, Group Congruency qualified this effect, $F(1,29) = 5.08$, $p = .032$. The congruency effect (incongruent-congruent response latency) for the HPC condition was larger (M = 100 ms) than that for the LPC condition (M = 86 ms), thus showing a 14 ms social-context-specific PCE.

Notably, there was no hint of an interaction between Group Congruency, Arrows Congruency, and Individual Face Consistency, $F < 1$, showing that, as can be observed in Table 1, the modulation of Group Congruency was similar for the two face types, with 12 and 15 ms social-context-specific PCE, respectively for inconsistent and consistent faces [1].

Discussion

The results of Experiment 1 extend the context-specific control findings of prior studies (Bugg et al., 2008; Crump et al., 2006; Lehle & Hübner, 2008; Vietze & Wendt, 2009; Wendt & Kiesel, 2011) to the domain of social categories. Whereas prior studies have shown that spatial location, font, and color serve as a contextual cues to control attention, here we demonstrate that faces can also serve as such a contextual cue. However, our results go beyond those of all prior studies by demonstrating that the context-specific control learned through associations with the consistent category members (i.e., the three faces that were paired with mostly congruent flanker trials) generalized to inconsistent category members (i.e., the one face that was paired with mostly incongruent flanker trials). These results rule out explanations of the effect that are based on entirely on specific stimulus-response associations (Schmidt & Besner,

[1] A corresponding analysis of errors revealed only a main effect of Arrows Congruency, $F(1,29)= 32.33$, $p < .001$; error rates were higher for incongruent trials (4.12%) than for congruent trials (.05%). Specific analyses showed that neither gender of the participants nor gender of the faces have any significant effect on the results.

2008; Schmidt, Crump, Besner, & Cheesman, 2007), and instead support the view that an adaptive change in attentional control is responsible for the effect (Bugg, Jacoby, & Chanani, 2011; Crump & Milliken, 2009; Jacoby et al., 2003).

Note that in the current study the context faces were presented 400 ms before the flanker stimuli used to measure attentional control. It might be argued that this 400 ms lead time allows for strategic shifts in control in response to the faces contexts. However, an additional experiment was conducted in which the flanker stimuli were presented simultaneously with the context face, and this new experiment showed the same pattern of results as observed in Experiment 1[2]. Therefore, it appears that social categories can serve as a cue for rapid and flexible adjustments in attentional control.

From a social perspective, the results represent a clear case of person categorization; mere exposure to faces that are irrelevant to the conflict task seems to be sufficient to trigger the retrieval of a social category (i.e., gender). In turn, the

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[2] A new experiment was conducted with 30 new participants (21 women mean age 23) from the same pool. This new experiment was exactly the same as Experiment 1, except that the face context was presented simultaneously with the flanker task, instead of appearing 400 ms before.

The results perfectly replicated those from Experiment 1. The analysis revealed a main effect of Arrows Congruency, $F(1,29) = 211.80$, $p < .001$. Responses on congruent trials (M=569ms) were faster than on incongruent trials (M=657 ms). Importantly, Group Congruency qualified this effect, $F(1,29) = 6.69$, $p = .015$. The congruency effect (incongruent-congruent trials' response latency) for the HPC condition was larger (M = 92 ms) than that for the LPC condition (M = 84 ms), thus showing a 8 ms social-context-specific PCE.

Notably, there was no hint of an interaction between Group Congruency, Arrows Congruency, and Individual Face Consistency, $F < 1$.

Combined analysis of the two experiments showed a main effect of experiment, $F(1, 58) = 3.99$, $p = .051$. Participants in Experiment 1 were faster (584 ms) than those from the control experiment (613 ms). Importantly, the interaction between Group congruency and Arrows Congruency was significant, $F(1, 58) = 9.90$, p= .003. The congruency effect for the HPC condition was larger (M = 95 ms) than that for the LPC condition (M = 85 ms), thus showing a 10 ms social-context-specific PCE. This effect was not significantly different between experiments, $F < 1$. Furthermore, there was no hint of a 3-way interaction between Group Congruency, Arrows Congruency, and Individual Faces consistency, $F < 1$.

association between gender and the need for selective attention triggers adaptive changes in attentional control. These findings provide strong support for the prominent role of category-based perception in person construal and its automatic behavioral effects. When participants are not motivated to focus on unique entities, they tend to rapidly categorize faces using the available physiognomic cues (e.g., features indicative of gender). In the present context, as a consequence of this categorization, it appears that participants activated information they learned about the likelihood of congruency that was associated with gender categories rather than with specific faces. Consequently, the same congruency effects were observed for consistent and inconsistent faces, despite the fact that consistent and inconsistent faces were associated with different congruency likelihoods.

Experiment 2

In Experiment 1, female and male faces were associated with either a high or low proportion of congruent flanker trials, and a social-context-specific PCE was observed. Importantly, this effect was observed even for category-inconsistent faces, which had an opposing proportion congruency association to that of their gender group. As such, the results suggest that participants categorized faces as belonging to one of the two gender categories, rather than individuating them, and that gender categorization automatically modulated cognitive control.

To test whether this learned category contingency would generalize to new group members, with whom participants did not have previous experience, in Experiment 2 we presented an additional block of trials with new faces for which there was no proportion congruency manipulation. In this block, four new male and female faces were presented, and each face was associated with an equal proportion of congruent and incongruent flanker trials (see also Bugg et al., 2011; Crump & Milliken, 2009).

In addition, it is well known that perceivers' motivation can play an important role in directing attention to categorical or identity-specific facial characteristics (Brewer & Brown, 1998; Fiske & Neuberg, 1990; Hugenberg, et al 2010; Macrae et al., 1997). In Experiment 2 we investigated whether gender-based categorization would control attention in the same way as in Experiment 1 if participants were given explicit

instructions to individuate. To that end, we manipulated the instructions given, asking participants to pay attention to the faces either as individuals or as members of gender categories.

Method

Participants

Thirty-five students (19 women, mean age 20 years) participated in the experiment in exchange for course credits. All participants reported normal or corrected-to-normal vision and hearing, and were naïve to the purpose of the experiment.

Apparatus, Stimuli and Procedure

The same apparatus and stimuli used in Experiment 1 were used in the Learning block of Experiment 2. Eight faces, however, were added in an additional Transfer block (see Figure 2, panel b). Participants performed 16 practice trials and five experimental Learning blocks of 128 trials each. Next, they performed one additional Transfer block of 64 trials. In the Transfer block, the new stimuli (four male and four female faces) appeared equally often with congruent and incongruent trials.

Before beginning the Flanker task, we included a between group instruction manipulation that asked participants to direct their attention to different aspects of the faces. The Individualization Group (N = 19) was instructed to pay attention to the identity-based features of each face, whereas the Categorization Group (N = 16) was instructed to pay attention to the category-based features of the faces (i.e., gender).

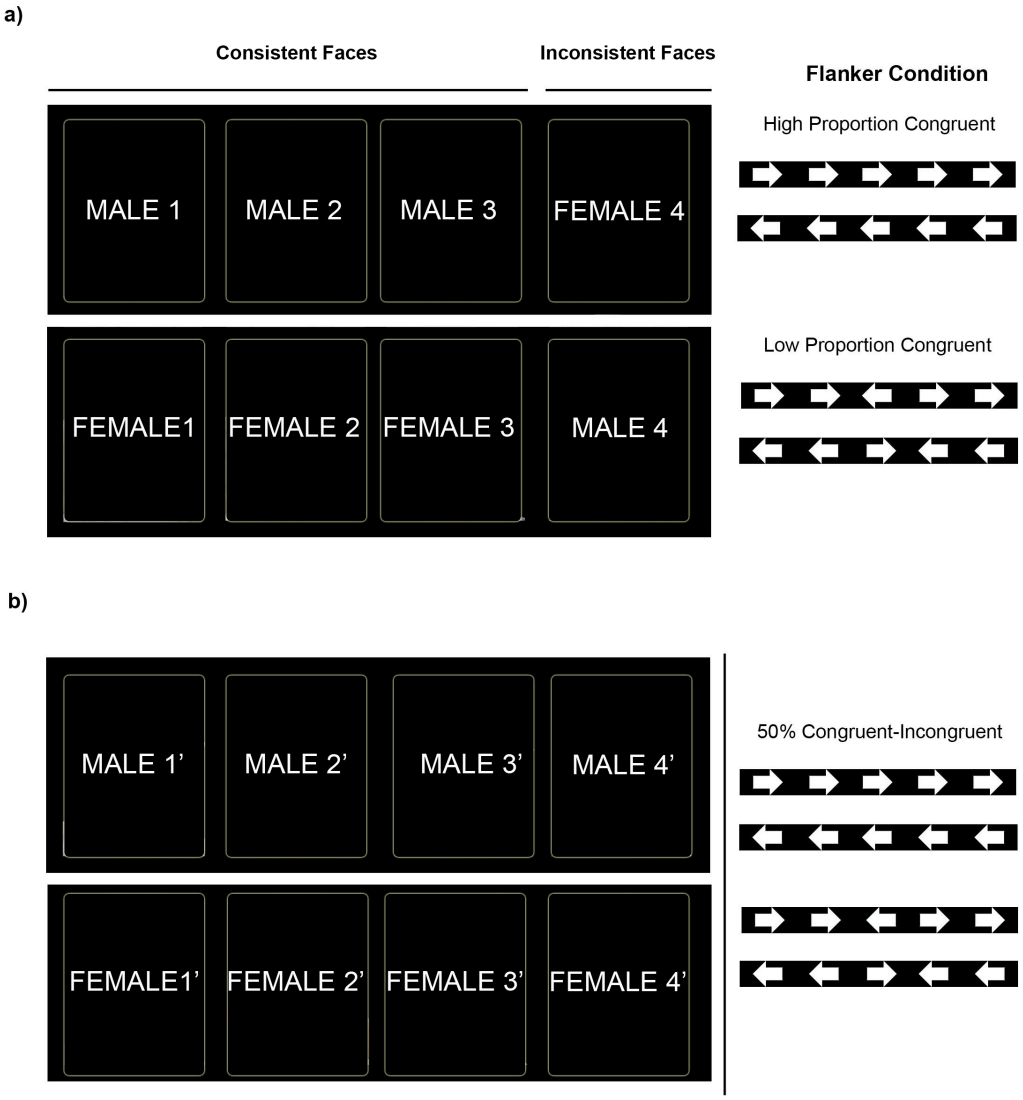

Figure 2: a) Example of stimuli presented and group congruency manipulation when males were paired with High Proportion Congruent and Females with Low proportion Congruent. b) Example of stimuli presented in the transfer block (Experiment 2).

Results

The same outlier criterion as in Experiment 1 was used. RT outliers (3.5%) and errors (3.7%) were excluded from the analysis. Practice trials and the first block were considered as practice and they were not included in the analysis. Data from one participant in the Individualization Group were discarded due to an error rate higher

than 50%. The data for the Learning block and the Transfer block were analyzed separately.

Learning block mean RTs were submitted to a repeated measure ANOVA that included Group Congruency (HPC vs. LPC), Face Consistency (Consistent vs. Inconsistent with the group) and Arrows Congruency (Congruent vs. Incongruent) as within subject factors, and instruction manipulation as a between subjects factor (see Table 1).

Table 1. Mean correct direction-discrimination response latencies in ms and error percentage (in brackets), for Experiments 1 and 2.

Experiments		**Consistent Faces (CF)**				**Inconsistent Faces (IF)**				**Social-context specific PCE (HPC-LPC)**	
Exp.1		HPC		LPC		HPC		LPC		CF	IF
	Congruent (C)	540	(.4)	539	(.5)	530	(.5)	541	(.4)		
	Incongruent (I)	640	(3.9)	627	(3.6)	629	(4.5)	625	(4.4)		
	Congruency effect (I-C)	100		88		99		84		12	15
Exp.2 Learning											
Indiv	Congruent(C)	556	(.5)	567	(.5)	566	(1.2)	559	(.5)		
	Incongruent (I)	672	(4.1)	666	(4.3)	663	(3.7)	663	(4.3)		
	Congruency effect (I-C)	116		99		97		104		17	-7
Categ	Congruent (C)	553	(.9)	556	(.5)	540	(1.2)	554	(.5)		
	Incongruent (I)	644	(5.4)	644	(4.1)	648	(3.7)	636	(4.3)		
	Congruency effect (I-C)	91		88		108		82		3	26
Exp.2 Transfer											
Indiv	Congruent (C)	569	(.3)	560	(.6)						
	Incongruent (I)	672	(7.9)	664	(5.7)						
	Congruency effect (I-C)	103		104						-1	
Categ	Congruent(C)	578	(.4)	587	(.8)						
	Incongruent (I)	681	(5.4)	648	(6.9)						
	Congruency effect (I-C)	103		61						42	

Note: PCE = Proportion Congruency Effect; HPC = High Proportion Congruent; LPC = Low Proportion Congruent

As in Experiment 1, there was a main effect of Arrows Congruency, $F(1,33) = 209.65$, $p < .001$, that was qualified by Group Congruency, $F(1,33) = 6.84$, $p = .013$. The congruency effect was larger in the context of the gender associated to HPC (M = 103 ms) than when presented in the context of the gender associated to LPC (M = 93 ms). More important, the 4-way interaction was also significant, $F(1,33) = 7.80$, $p = .009$. A 2 (Group Congruency) X 2 (Arrows Congruency) X 2 (Instructions) partial ANOVA conducted on only the Category Inconsistent trials revealed a significant interaction between the three factors, $F(1, 33)=7.15$, $p = .012$. As shown in Table 1, only participants in the Categorization Group showed a larger congruency effect for the HPC gender (M = 108ms) than for the LPC gender (M =82 ms), $F(1,15) = 12.55$, $p = .003$. The Individualization Group showed the opposite pattern (97ms vs. 104ms), although the difference was not significant, $F(1,18) < 1$. The same analysis on Category Consistent faces showed a trend toward the Social-context-specific PCE, $F(1,33) = 3.89$, $p = .057$, independent of the instruction manipulation, $F(1, 33) = 1.85$, $p = .184$. [3]

Transfer Block mean RTs were submitted to a 2 (Group Congruency) X 2 (Arrows congruency) X 2 (Instructions) mixed ANOVA. This analysis revealed a significant Arrows Congruency effect, $F(1, 33) = 178.38$, $p < .001$, with faster responses on congruent (M = 574ms) than on incongruent (M = 666ms) trials. Furthermore, this effect was qualified by Group Congruency, $F(1,33) = 4.80$, $p =.036$. However, the key result was a significant 3-way interaction involving Arrows Congruency, Group Congruency and Instructions, $F(1,33) = 6.08$, $p = .019$. Subsequent analyses that focused on the two Instruction groups separately revealed that the Congruency by Group Congruency interaction was significant only for the group instructed to categorize. The PCE was 42 ms larger for the HPC group than for the LPC group with categorization instructions, $F(1,33) = 9.98$, $p = .003$); whereas it was 1 ms

[3] A corresponding analysis of error rates revealed only a main effect of Arrows Congruency, $F(1,33) = 30.23$, $p < .001$; error rates were higher for incongruent trials (5.8%) than for congruent trials (0.60%).

smaller for the HPC group than for the LPC group with Individualization instructions ($F < 1$; see Table 1). The PCE effect for the categorization instructions was almost entirely attributable to differences in performance for the incongruent items across the two contexts, with RTs being 32 ms faster for incongruent trials in the LPC group than in the HPC group, $F(1,33) = 9.84$; $p = .004$. [4]

Discussion

The purpose of Experiment 2 was to determine whether the social-context proportion congruent effect would generalize to new members of the two gender categories, and to examine whether this effect is subject to instructional influences. The results from the learning block replicated those of Experiment 1, with a social-context-specific PCE occurring for group-inconsistent faces. More interestingly, this effect was also qualified by instructions. Participants instructed to pay attention to individuating information in the faces did not show the social-context-specific PCE for inconsistent faces. Furthermore, during the transfer block, participants given instructions to categorize transferred the congruency association from the learning blocks to the new faces, whereas participants given instructions to individualize showed no such effect. These findings demonstrate that when people focus on individuating information, categorical processes do not necessarily occur for other members of the same group.

An important property of this transfer effect to new faces merits note. In particular, Bugg et al. (2011; see also Schmidt & Besner, 2008) noted that if a PCE effect is due to changes in control over processing of an irrelevant stimulus dimension, rather than to changes in stimulus-response associations that might develop when items occur with different frequencies, then the context effect ought to occur primarily for the incongruent items rather than for the congruent items. This logic follows from the fact

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[4] A corresponding analysis of error rates revealed only a main effect of Arrows Congruency $F(1,33)= 29.76$, $p < .001$, with more errors for incongruent trials (6.47%) than for congruent trials (0.50%). Specific analyses showed that neither gender of the participants nor gender of the faces had any significant effect on the results.

that conflict effects like Stroop and flankers are primarily due to interference from the irrelevant dimension on incongruent trials, rather than to facilitation from the irrelevant dimension on congruent trials. Indeed, the context-specific PCE effect that transferred to new faces in this experiment was almost entirely due to changes in performance across context for the incongruent trials; responses for the incongruent trials were 32 ms faster for the low proportion congruent condition than for the high proportion congruent condition. Bugg et al. (2011) has reported a similar result using a picture-word variant of the Stroop task. Together with recent neuroimaging results indicating that context-specific control effects are mediated by activity in brain structures (e.g., medial superior parietal lobe) known to play an important role in voluntary control (King, Korb & Egner, 2012), the behavioral results here and in the Bugg et al. (2011) study strongly implicate context-specific control over processing of irrelevant distractors.

General Discussion

One of the purposes of the present study was to determine whether social categories, such as the gender of facial stimuli, could serve as contextual cues that would produce 'stereotypical' allocation of attentional control. To that end, we used consistent and inconsistent category members as context for the allocation of attentional control, and focused on key outcomes with both the cognitive control and social cognition literatures in mind.

More specifically, we used the context-specific proportion congruent logic introduced by other researchers (Bugg, Jacoby & Toth, 2008; Crump et al., 2006; Crump et al., 2008; Crump & Milliken, 2009; Lehle & Hubner, 2008; Schimdt, Crump, Cheesman, & Besner, 2007; Vietze & Wendt, 2009; Wendt & Kiesel, 2011; Heinemann, Kunde, & Kiesel, 2009) to investigate whether male and female gender faces associated with different proportions of congruency would cue attentional control in different ways. In line with previous studies, our results demonstrate that faces are indeed effective cues to control selective attention.

Specifically, Experiment 1 showed that participants learned the association between gender categories and the proportion of congruency, and allocated control accordingly, using the gender category as context rather than the individual diagnostic information within each single face. A key result from this study is that participants allocated the same attentional control to all targets within a gender category, regardless

of the specific proportion of congruency associated to each individual within the category. That is, they allocated the same attentional control to category inconsistent faces (the one face in a gender group that was associated with an opposite proportion of congruency to the other three members of the same gender group). To our knowledge, there are no previous studies that have examined context-specific control that have demonstrated an effect that generalizes to items on the basis of a shared contextual cue (e.g., gender in this case), but for which the item contingencies predict the opposite result.

A second key result from the present study concerned the transfer phase of Experiment 2, in which the context-specific PCE generalized to new faces with which the participants had no prior experience. This result clearly implicates a form of control over attention that hinges on rapid categorization of the gender of faces, rather than item-specific learning. Furthermore, this context-specific PCE observed for the transfer items was almost entirely due to a difference across contexts in performance for the incongruent trials, a result that highlights the role played by the gender context in controlling the influence of the irrelevant distractors on performance (see Bugg et al., 2011).

In addition, these results support the view that social categories are automatically activated in the presence of a triggering stimulus, a crucial property of contemporary models of person perception (e.g. Brewer, 1988; Devine, 1989; Fiske & Neuberg, 1990). Indeed, research on social perception indicates that when examining information about themselves and others, people often rely on information that confirms their preconceptions (e.g. Snyder & Gangestad, 1986; Swann & Read, 1981) and then behave according to those preconceptions. The results of Experiment 2 add to this literature by demonstrating that the social-context-specific PCE can be influenced by momentary motivations. In particular, the social-context PCE was observed only for participants instructed to focus on gender categories in Experiment 2. Furthermore, in the transfer block, generalization of the social-context PCE to new items occurred only when participants were instructed to focus on gender categories, and did not occur when participants were instructed to focus on individual faces. This result echoes the importance given to motivation in social perception models (e.g. Fiske & Neuberg, 1990; Devine, 1989) and the debate about unconditional automaticity of social categorization (see Macrae & Bodenhausen, 2001).

It is particularly important in our study that, instead of using the content of well established cultural stereotypes to investigate how they are activated and used when performing a task for which the stereotype is irrelevant, we investigated those processes by creating a new stereotype: female vs. male faces were generally associated with different congruency proportions. Our results show that our procedure might be useful to investigate the processes underlying the creation and use of implicit stereotypes, and that gender categorization can be easily used to learn new stereotypes. Future research should focus on whether other variant (e.g., emotional expression, gaze direction, smiling) and invariant (e.g., age, race, attractiveness, healthiness) features of people, which can be extracted from faces with minimal visual cues (Macrae & Quadflieg, 2010), can equally be used to learn new stereotypes.

Another interesting property of our data is that the social-context-specific PCE generalized to new category members with whom participants had no previous experience in the transfer block. As is the case with stereotype associations, these findings reveal the predictive power of the new associations built during the experimental procedure for linking gender categories with different proportions of congruency, and that participants make use of these associations when responding to the task. It is important to note, however, that we used faces of people unknown to participants. We do not know whether a similar social-context-specific effect would have occurred for faces known to the participants. It will be interesting to investigate how and/or whether new stereotypes are also implicitly learned or applied to people with whom we have previous individual experience. Perhaps with familiar people the individual rather than the categorical context will determine the allocation of attentional control.

In sum, our results provide new evidence that social context can modulate attentional control processes rapidly and flexibly. Importantly, these shifts of attentional control were learned through associations of proportion congruency with a particular set of stimuli, and yet the shifts of attentional control transferred to both inconsistent and novel stimuli. Moreover, explicit instructions to individualize modulated this learning effect. These effects have important implications for social interactions. In particular, the application of associations learned from consistent group members to inconsistent group members that we observed here appear to implicate stereotype-like processes in

shifts of attentional control. As such, the method used here may be a useful tool for further study of implicit categorization-individuation social processes.

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EXPERIMENTAL SERIES 2

SOCIAL CATEGORIZATION

BY EMOTIONS

Social Categorization by emotions

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Abstract

Numerous studies have shown that people spontaneously categorize other individuals based on their gender, ethnicity, and age. But what about the emotions they express? The present experiments attempted to investigate the role of emotional expression in category formation. In particular, the context specific proportion congruency effect was used to assess the implicit generation of emotional categories (Cañadas, Rodríguez-Bailón, Milliken, & Lupiáñez, in press). In this procedure, we asked whether emotion expressions function as a contextual cue to control attention (Angry vs. Happy expressions in Experiment 1; True vs. False smiles in Experiment 2; Happy vs. Sad expressions in Experiment 3). Emotionally expressive faces were used as a general context associated with a specific proportion of congruent/incongruent flanker trials. Faces expressing a given emotion were associated with a high (or low) proportion of congruent trials, while faces displaying a different emotion were associated with a low (or high) proportion of incongruent trials. We also created consistent and inconsistent category members within each of these two general contexts. In accordance with our findings related to gender categories (Cañadas et al., in press), we found that participants showed a larger congruency effect for faces from the emotional group associated with a high proportion of congruent trials, which transferred to the inconsistent emotional faces in the group. Our findings also suggest that not all emotional expressions result in these categorization processes. In particular, sad vs. happy expressions did not produce proportion congruency effects. These results provide the first findings that attentional control can be allocated flexibly as a function of the consistency of an individual with an emotional category.

The emotional expressions of others play an important role in daily situations, especially in social interactions (Nachson, 1995). Facial expressions of emotion in particular communicate information about the person and about the environment that elicits rapid responses in the observer (Niedenthal & Brauer, 2011). Such responses include inferences about the state of mind of the expresser of the emotion, and changes in the observer's own behavior to deal with the situation (Adams, Ambady, Macrae, & Kleck, 2006; Anderson & Thompson 2004; Brown, Palameta, & Moore, 2003; Marsh & Ambady, 2007; Marsh, Ambady, & Kleck, 2005). Although social psychologists are knowledgeable about what information facial expressions convey, less is known about whether and how facial expressions might serve to regulate cognitive processing. The present set of experiments was designed to evaluate the possibility that facial expressions of emotion can cue attentional control, and in ways that are similar to other social categories.

Attentional Control and Social Categories

An experimental indicator of attentional control is the modulation of performance on typical attentional interference tasks by contextual cues. In a standard flanker task, for example, the speed with which a central target is processed is affected by the congruence between the target and surrounding distractors. For example, responses indicative of the direction of a target arrow are faster when surrounding arrows point in the same (congruent) direction compared to the opposite (incongruent) direction. The automatic interference produced by incongruence of the stimulus display can be modulated, however, by the proportion of trials on which distractors are congruent with the target. In particular, the difference in performance on congruent and incongruent trials (i.e., the congruency effect) appears to be smaller when proportionally fewer trials contain congruent targets and distractors. This occurrence suggests that distractor processing is attenuated when the likelihood of congruent trials is low (Gratton, Coles, & Donchin, 1992; Lowe & Mitterer, 1982), an effect known as Proportion Congruent Effect (PCE) (Logan & Zbrodoff, 1979).

Subsequent research has examined the impact of stimuli (item specific control; Jacoby, Lindsay, & Hessels, 2003) and contexts (context specific control; Crump, Gong, & Milliken, 2006) on this effect to rule out the awareness of contingencies as the primary mechanism for attentional control cuing. That is, if the proportion of congruent

trials leads to the development of specific expectancies about the need for control in subsequent trials, it could activate more or less control resources (e.g., Braver, Gray, & Burgess, 2007). However, if either a high or low proportion of congruency is associated with specific task stimuli, or an irrelevant context, in which the overall proportion of congruency is balanced (i.e., 50% congruent), no expectancy can be generated. Nonetheless, contextual cues, such as spatial location, when specifically associated with a different proportion of congruency can cue the extent to which visual attention is allocated to solve interference. This effect suggests the automatic cueing of allocation of attentional resources. Recent research demonstrates this context specific attentional control modulation with a variety of perceptual dimensions (Bugg, Jacoby, & Toth, 2008; Crump et al., 2006; Crump, Vaquero, & Milliken, 2008; Lehle & Hübner, 2008; Vietze & Wendt, 2009; Wendt & Kiesel, 2011).

Particularly pertinent to the present work are attentional control effects related to categorical knowledge. For example, research has demonstrated that the proportion congruent effects can transfer to categorically related items not previously presented in the experiment. Specifically, Bugg and his colleagues used a Stroop picture-word task in which participants were instructed to name the word aloud. Four animal words (bird, cat, dog, and fish) and their corresponding pictures were paired and associated with either a high or low proportion of congruency. For example, stimuli related to birds and cats were paired with a high proportion of congruent trials (75%, HPC) whereas stimuli related to dogs and fish were paired with a low proportion of congruent trials (25%, LPC). The two sets of stimuli never overlapped (e.g., the word dog was never paired with the picture of a bird or a cat). In an additional block, the same words were paired with new exemplars (i.e., pictures) of the animal categories, however in this block the congruency was uninformative (50%). The results replicated previous findings by showing a larger congruency effect for items associated with a HPC than a LPC. Importantly, this effect occurred not only for the previously presented pictures but also the novel stimuli in which congruency was neutral. These findings indicate a flexible and automatic allocation of attentional control that changes according to the task demands.

If the allocation of attentional control depends on the fast categorization of a context as either demanding or not demanding control, this fast categorization is likely to occur automatically on the basis of salient categorical features. Although such fast

categorization processes occur in a range of contexts in which people have high levels of perceptual expertise, the classification of social stimuli has been shown to be particularly prevalent (Brewer, 1988; Fiske & Neuberg, 1990; Cuddy, Fiske, & Glick, 2004; Nelson, 2005; Kawakami, Dion, & Dovidio, 1998).

Human faces are important cues for attentional control because they offer valuable information and are crucial to social interactions (Johnson & Morton, 1991). Our research using a modified Flanker task, for example, has demonstrated that participants spontaneously use gender of the faces as context to flexibly control attention (Cañadas et al., in press). Specifically, on each trial in this experiment, participants were presented with an image of a face and a stimulus array consisting of five arrows above or below the face. The faces, therefore, served as the context for the stimulus arrays. In the congruent conditions, all five arrows pointed in the same direction. In the incongruent conditions, the central arrow and the four flanking distracters pointed in opposite directions. Participants were instructed to respond as quickly and accurately as possible to the direction of the central arrow by pressing the appropriate button. Importantly, a given context (e.g., male faces) was associated with a HPC trials, whereas the other context (e.g., female faces) was associated with a LPC trials. As expected, larger interference effects were found when the arrows appeared in a context (e.g., male or female faces) associated with a high proportion of congruent stimulus arrays indicating less allocation of control in this context (Crump et al., 2006).

Importantly, the consistency of the faces within the group was manipulated in these studies. In particular, one face within each group was associated with the same proportion of congruency associated with the other group. For instance, a female face was paired with the proportion of congruency of most male faces or a male face was associated with the proportion of congruency corresponding to most female faces. In accordance with the procedure by Bugg, Jacoby, Chanani, (2011) an additional block with novel faces from both groups was included where congruency was unbiased (50%). The results demonstrated that knowledge from the category consistent faces transferred to both the inconsistent faces (e.g., a male face associated with the proportion of congruency of the female faces and a female face associated with the proportion of congruency of the male faces) and the unbiased novel faces. These transfer effects indicate more attentional control was deployed when presented with

faces of the category associated to LPC than to HPC regardless of the congruency proportions associated with the specific face.

Furthermore, subsequent research indicates that participant's motivation to attend to individual vs. category-related features of the faces (Cañadas et al., in press), expertise (Tanaka, 2001; Tanaka & Taylor, 1991), and familiarity (Cañadas et al., in prep) can moderate the extent that gender categories or individual faces impact allocation of attentional control. Together these results suggest that although general categorization processes underlie person perception, these effects can be modulated by some perceiver related factors.

The Present Research

The main goal of the present research was to examine whether other social stimuli, in particular emotional expressions, can also serve as contextual cues for the rapid adjustment of attentional control. To this end, we used facial expressions of emotion as the target category, and associated these expressions with a particular proportion of congruency in flanker task stimulus arrays. We were interested in whether facial emotional expressions are used as contextual cues to allocate attentional control by establishing new implicit associations between the emotion category and the need for attentional control. Furthermore, we explored whether the pattern of attentional control related to category inconsistent associations observed with well-established social group stereotypes generalizes to emotional expressions.

Another goal of the present experiments was to test whether person impression drives this social-context–specific proportion congruency effect (PCE). Specifically, we investigated whether information from emotional expressions, such as perceived trustworthiness, might underlie the attentional control effect. Recent research has demonstrated that people are extremely fast at forming impressions from minimal information. For example, the presentation of a neutral face for only 100 ms is sufficient for people to form impressions about trustworthiness, competence, and sexual orientation (e.g., Ambady, Hallahan, & Connor, 1999; Willis & Todorov, 2006). Furthermore, once impressions have been formed, they impact the course of future interactions (Todorov & Uleman, 2002, 2003). When we first meet unfamiliar people, trustworthiness determines how we interact with them. In future encounters, whether we approach or avoid them is based on our initial assessment of their facial features.

While the positive end of the trustworthiness continuum is anchored by the expression of happiness, the negative end of the continuum, in contrast, appears to be anchored by the expression of anger (Engell, Haxby, & Todorov, 2007; Todorov, 2008). Experiment 1 seeks to evaluate whether these two emotions (i.e., happiness vs. anger) can serve as context for the allocation of attentional control and thus produce the social-context-specific PCE; more specifically, we wanted to investigate whether participants use information from associations in the flanker task and these emotions in a categorical or individual manner.

In Experiment 2, we were interested in exploring the categorization-individuation hypothesis by testing whether it is the participant' impression (such as trustworthiness) or the physical appearance of the faces (characteristic features specific to the emotions) that drive this effect. In particular, we wanted to investigate whether categorization is determined by the impressions (Bar, Neta, & Linz, 2006; Willis & Todorov, 2006) that participants form of the context faces or by specific features of each individual face (Etcoff & Magee, 1992). With this goal we included only happy faces in this study (to equate characteristic features of the emotion), but manipulated trustworthiness by selecting faces portraying either true or false smiles.

In Experiment 3, we attempted to replicate this pattern of results using different emotional categories --happy and sad expressions. These two emotion categories were chosen because they are often considered to be "opposite" emotions (Russell & Carroll, 1999) and therefore mutually exclusive, and the facial features associated with each emotion are distinct. While happy expressions are characterized by upward turn corners lips, lifted cheeks, and slightly raised eyebrows, sad expressions are characterized by upside down corner lips, relaxed or drooping cheeks and eyebrows raised and pulled together (Ekman & Friesen, 2002).

We predicted higher congruency effects for the emotional expression associated with a HPC trials than a LPC trials (i.e., categorization by emotion) in Experiments 1 and 3, thereby supporting an automatic categorization of faces by emotion. We also expected the same congruency effects for all the faces expressing the same emotion regardless of the proportion of congruency associated with each particular face (either consistent or inconsistent). Specifically, we propose that participant's responses will be related to emotional categories (i.e., happy/angry or happy/sad) rather than information

extracted from congruency proportions associated with each individual face. However, if participants' impression of trustworthiness drives the allocation of control categorically in Experiment 1 for happy and angry faces and for happy and sad faces in Experiment 3, the same congruency effect should be found for consistent and inconsistent members of the emotional expression categories even when faces show the same emotional expression (happiness) but participants perceive differences in their impression on trustworthiness (Experiment 2). These latter results would support the importance of the role of perceivers' impression, as opposed to differences in facial features, in categorization processes related to emotional expressions.

Experiment 1

In Experiment 1 we associated different emotional contexts (i.e., happy vs. angry faces) with different proportions of congruent trials in a flanker task. For half of the participants, angry faces were associated with HPC trials, while happy faces were associated with LPC trials; for the other half of the participants the association between contexts and proportion of congruency was reversed.

Furthermore, we created consistent and inconsistent category members within each of these two contexts. Specifically, three stimuli related to one category (e.g., angry) were associated with HPC trials (consistent stimuli), whereas a fourth stimulus of the same category was associated with LPC trials (inconsistent stimulus), and vice versa for the other group (i.e., happy).

We decided to use these two emotional expressions for several reasons. Firstly, happy and angry expressions involve different facial configurations (Ekman & Fischen, 2002). Secondly, they also differ in valence. Evidence so far suggests the involvement or certain brain areas in processing individual emotions and/or different valence of facial expressions. Specifically, the ventromedial prefrontal cortex, and possibly the amygdala, have been associated with processing happy faces (Keightley, Chiew, Winocur, & Grazy, 2007; see also Ruffman, Henry, Livingstone, & Phillips, 2008). The dorsomedial prefrontal cortex, alternatively, has been associated with the processing of negative expressions (Williams et al., 2006; Keightley et al., 2007). Finally, analyses of self-reports confirm that these emotions are negatively correlated (e.g., Bonanno & Keltner, 2004; Ekman, Friesen, & Ancoli, 1980), and generate contradictory impressions (Willis & Todorov, 2006).

Method

Participants

Thirty-six students (6 males) from York University (M = 22.9 years) participated in the experiment in exchanged for course credit. All participants were naïve as to the purpose of the study.

Stimulus material, tasks and study design

Stimulus presentation, timing, and data collection were controlled using the E-prime 2.0 software package run on a standard Pentium 4 PC. Stimuli were presented on a 17" computer screen and consisted of sixteen different photographs of women from the NimStim Set of Facial Expressions (http://www.macbrain.org/resources.htm). The sixteen faces from eight different models each portrayed a happy and angry expression (see Figure 1, Panel A).

Each participant was randomly assigned to one of four counterbalanced conditions and presented with 8 of the 16 photographs. Four photographs depicted happiness and four photographs depicted anger. In an initial pilot study, a separate group of participants (n = 20) were ask to identify the emotion on each face and to rate faces on trustworthiness using a 1 (not at all trustworthy) to 7 (very trustworthy) Likert scale. Over 80% of participants correctly identified each emotion. Furthermore, in accordance with previous results (Engell, Haxby, & Todorov, 2007; Todorov, 2008) a paired t-test demonstrated that participants rated happy faces (M = 5.01, SD = .90) as significantly more trustworthy than angry faces (M = 2.72, SD = 1.10), t(19) = 7.49, p <.001.

The experiment used a modification of the Eriksen's Flanker task (Eriksen and Eriksen, 1974) in which each trial consisted of a 200 ms fixation cross followed by the central presentation of an emotional face representing the context (see Figure 2). After a 400 ms interval, five arrows were presented above or below the face for 2000 ms or until response. In the congruent condition, all five arrows pointed in the same direction. In the incongruent condition, the central arrow and the four flanking distracters pointed in opposite directions. Participants were required to respond as quickly and accurately as possible to the direction of the central arrow by pressing either the "Z" (left) or "M" (right) key. Participants were instructed to attend to the faces because they would be ostensibly related to subsequent questions. The inter-stimulus interval was 1000 ms and participants were given breaks between blocks.

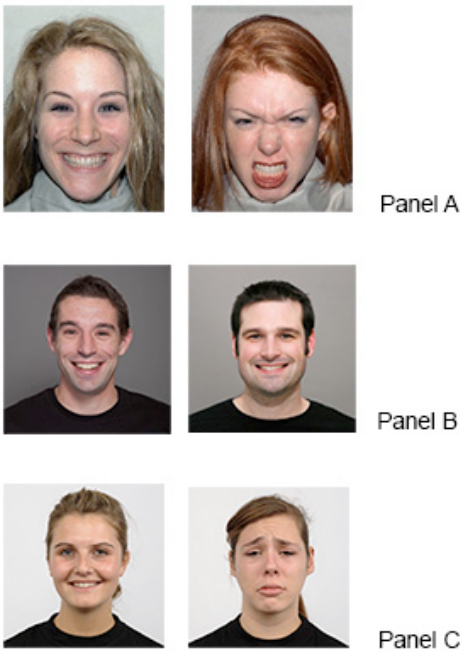

Figure 1: Example of stimuli presented. Panel A illustrates stimuli from Experiment 1 (happy left- angry right), Panel B illustrates stimuli from Experiment 2 (true smile left –false smile right). Panel C illustrates stimuli from Experiment 3 (happy left- sad right).

Furthermore, we used the facial stimuli to create two types of contexts: the individual face context, and the category (emotion) group context. We associated each face with different proportions of congruency within the flanker task. As a result, three stimuli of one group (e.g., happy) were associated to HPC (75%) trials (i.e., consistent faces), whereas a fourth stimulus of the same group was associated with LPC (25%) trials (i.e., inconsistent face). The opposite association was established for the other group. The group and the specific stimulus associated with high or low proportions of arrows congruency was randomly selected and counterbalanced between participants. In summary we created four different counterbalance orders to present each group of faces equally associated to a high or low proportion of congruency. Each specific face was equally associated to the consistent and inconsistent condition. Before beginning the trials, all participants performed one practice block consisting of 16 trials followed by five experimental blocks of 128 trials each.

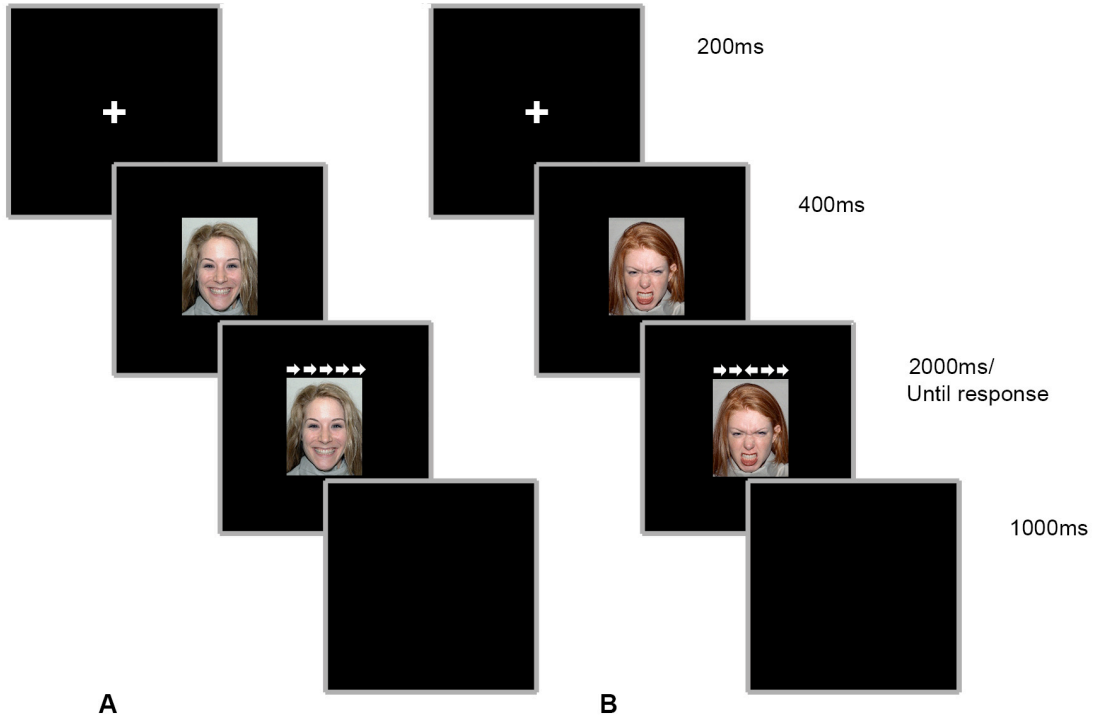

Figure 2: Examples of presentation latencies in Experiment 1. Panel A illustrates a congruent flanker trial, with a happy context face. Panel B illustrates an incongruent trial, with an angry context face.

Results

Data related to the practice and first block were excluded from the analysis. Errors (3.1%) and outliers (i.e., latencies above and below 2.5 SD) (1.8%) were also excluded. Data from one participant with an excessive proportion of errors (i.e., more than 20%) and four participants who experienced technical problems in the computer program were not included.

Preliminary analysis on the mean response latencies demonstrated a significant congruency effect, $F(1, 30) = 106.07$, $p < .001$, in which participants took longer to respond to incongruent ($M = 651$ ms) than congruent ($M = 567$ ms) trials. Given that our hypotheses were based on the modulation of the congruency effect, we computed an index of the congruency effect (incongruent – congruent) for each experimental condition and participant to simplify analyses. This index was submitted to a repeated measure ANOVA that included Group Congruency (High vs. Low) and Individual Face

Consistency (Category consistent vs. Category inconsistent with the group) (see Table 1).

A main effect of Group Congruency was found, $F(1, 30) = 6.10$, $p = .019$, demonstrating a larger congruency effect for the HPC condition ($M = 88$ ms) than the LPC condition ($M = 80$ ms). Importantly, the interaction between Group Congruency and Individual Face Consistency was not significant, $F(1, 30) = 1.12$, $p = .30$, demonstrating that this congruency effect did not differ for consistent and inconsistent faces.

Furthermore, a corresponding analysis of error rates only revealed a main effect of congruency, $F(1, 30) = 33.50$, $p < .001$. All other effects or interactions were not significant, F's < 1.

Recent evidence suggests that different emotions drive and capture attention differently (Fox, et al, 2000; Ohman, Flykt, & Esteves, 2001; Vuilleumier & Shwartz, 2001). To examine this possibility, we analyzed participants for whom the happy emotion category was associated with a HPC and participants for whom the angry emotion category was associated with a HPC. Specifically, an Emotions (Happy vs. Angry) by Individual Face Consistency (Category Consistent vs. Category Inconsistent with the group) by Group Congruency (High vs. Low happy-angry) ANOVA was conducted on the congruency index. A main effect of Group congruency was found again, $F(1, 29) = 6.007$, $p = .021$, which was not modulated neither by Individual Face Consistency, $F(1, 29) = 1.13$, $p = .30$, nor Emotions $F(1, 29) < 1$. That is, regardless of whether happy or angry faces were associated with high proportion congruent trials, participants showed higher congruency effects for HPC than LPC contexts.

Discussion

The primary aim of Experiment 1 was to investigate whether different basic emotions (i.e., happy vs. angry) are used as contextual cues to allocate attentional control. These initial findings provide support for the social-context-specific PCE to the domain of emotions. In particular, the results reveal that those emotions associated with HPC trials showed a larger congruency effect than those associated with LPC trials. Furthermore, in accordance with previous results (Cañadas et al., in press), we also found that the social-context-specific PCE observed for the consistent instances of each emotion group (e.g., the three happy faces that were paired with mostly congruent flanker trials) generalized to the inconsistent members (i.e., the one face that was paired

with mostly incongruent flanker trials). These results indicate fast emotion categorization processes in which the mere exposure to eight unfamiliar women with emotional expressions is sufficient to activate and use the emotion as a basis for categorization.

Importantly, these results do not allow us to fully dissociate whether this categorization effect is due to specific emotional facial displays or to participant's impression of the faces. While it could be the case that the physical differences between the two pairs of emotions were sufficient to induce participants to categorize the women according to the emotions, another explanation also exists. Specifically, after participants perceived the emotional state of each face they formed an impression, which might have driven the categorization of the faces and the participant's attentional control to categorical rather than individual features.

Recent theorizing by Niedenthal and colleagues (Niedenthal & Halberstadt, 1995; Niedenthal, Halverstadt, & Innes-ker, 1999) supports this latter perceiver driven hypothesis -that impressions determine the categorization of emotional faces. From their "emotional response categories" hypothesis, they argue that it is the participant's impression of the emotional stimuli that guides category formation and application even for inconsistent faces.

The primary goal of Experiment 2 was to investigate whether the facial features of each emotion category or the impressions associated with each face, (i.e., whether the target is perceived as trustworthy or not), or a combination of both types of processes drive the present categorization process. In particular, all stimuli in this study depicted happiness but varied in the intended impression (low or highly trustworthy). It is well known that smiles can communicate several meanings, from "happiness" or "joy" (Frank, Ekman, & Friesen, 1997; Frank & Steennett 2001), which are characterized as positive emotions, to "affiliation" or "dominance", which serve to communicate and maintain social status (Abel 2002; Fogel, Nelson-Goens, Hsu, & Shapiro, 2000; Keltner, 1995; LaBarre, 1947; Tipples, Atkinson & Young. 2002). Given that positive outcomes related to smiling can promote intentions to cooperate and enhance social interactions; people have learned to fake this emotion (Krumhuber, & Manstead, 2009). In order to distinguish between these true and false affiliative intentions, social

perceivers have become adept at detecting when someone is falsely smiling (Ekman & Friesen, 1982; Weiss, Blum, & Gleberman, 1987).

Experiment 2

In order to test whether social impression of the stimuli (e.g. trustworthiness of the people in the pictures) is one mechanism that explains the results of Experiment 1, the current experiment focused on the same emotional expression (i.e., happiness); however, the stimuli varied in the extent to which they implicated the impression of trustworthiness.

Previous work has identified and distinguished between "true" or "sincere" and "false" or insincere" smiles (Bernstein, Sacco, Brown, Young, & Claypool, 2010; Cacioppo, Petty, Losch, & Kim, 1986; Ekman, Friesen, & Ancoli, 1980; Frank 2002; Hess and Kleck 1990; Maringer, Krumhuber, Fischer, & Niedenthal, 2011). While individuals showing true and false smiles share facial gestures with certain structural features (Ekman & Friesen, 1982; Frank, Ekman, & Friesen, 1997), Duchenne (1990) has identified facial markers that also distinguish between the two expressions. These "Duchenne markers" involve different intensity of the same facial muscle contractions. For "true" smiles, there is a pronounced contraction of the muscles around the eyes (the orbicularis), which cause a lift of the cheeks, a narrowing of the eye opening, and consequently the appearance of wrinkles around the eyes. The orbicularis' contraction is significantly reduced in the "false" smiles and consequently the others effects are also minimized.

Importantly "true" smiles are perceived as more spontaneous, authentic and reliable than "false" smiles (Gosselin, Beaupré, & Boissonneault, 2003; Gosselin, Perron, Legault, & Campanella, 2002; Giudice & Colle, 2007; Hess & Kleck, 1994, see Niedenthal, Mermillod, Maringer, & Hess, 2010 for a review). Given that people are exceptionally good at identifying/differentiating between these smiles and the personality traits associated with them (Ambadar, Cohn, & Reed, 2008; Hess and Kleck, 1994; Krumhuber, Manstead, Cosker, Marshall, & Rosin, 2006; Maringer et al, 2011, Miles & Johnston, 2007), we expected that using these Duchenne markers would vary the meaning of the happy emotions in these two types of smiles.

To investigate whether participants categorized the face contexts or rather applied specific control to individual faces, participants were presented with true or false smiles with one type of smile being associated with a higher or lower proportion of congruency. If people fail to differentiate between the two types of smiles and do not perceive two different contexts, there will consequently be no social-context-specific PCE. On the other hand, if people form an impression of smiles based on trustworthiness and categorize the 8 faces in two contexts, they should apply control based on their categorical impression of whether they could trust or not this people and consequently, as in previous experiments, will show a higher congruency effects for the type of smile associated with a HPC trials than a LPC trials.

Method

Participants

Thirty-six students (6 males) from Blaise Pascal Université (M = 22.9 years) participated in the experiment for course credit. All participants were naïve as to the purpose of the study.

Stimulus material, tasks and study design

The procedure employed in Experiment 1 was used in this study except that the emotional stimuli were now eight photographs of men portraying true and false smiles. These expressions were informed by an expert on the use of standard instructions (Ekman & Davidson, 1993) for eliciting different smiles (see Figure 1, Panel B). Each participant was randomly assigned to one of four counterbalanced groups and was presented with eight of the sixteen photographs, four depicting true and for depicting false smiles.

In an initial pilot study, a separate group of participants (n = 30) were ask to identify the emotion on each face and to rate faces on trustworthiness using a 1 (not at all trustworthy) to 7 (very trustworthy) Likert scale. All participants correctly identified the stimuli as a true or false smile. Furthermore, a paired t-test demonstrated that participants rated faces with true smiles (M = 4.93, SD = .73) as significantly more trustworthy than faces with false smiles (M = 3.39, SD = .87), t(29) = 7.21, p <.001.

Three consistent members and one inconsistent category member within each of the two contexts (true and false smiles) were created in accordance with procedures in

Experiment 1.Participants performed one practice block consisting of 16 trials followed by five experimental blocks of 128 trials each.

Results

In accordance with the previous analytic strategy, the data from the practice and first blocks were excluded from the analyses. Furthermore, trials with errors (2.7 %) or outliers (i.e., response latencies above or below 2.5 SD) (1.8%) were also excluded. Data from three participants with excessive error rates (i.e., large than 20%) were not included.

As in Experiment 1, the congruency effect index (incongruent – congruent trials) was computed and submitted to a repeated measure ANOVA that included Group Congruency (High vs. Low) and Individual Face Consistency (Category consistent vs. Category inconsistent with the group) (see Table 1).

A main effect of Group Congruency was found, $F(1, 32) = 5.76$, $p = .022$. As expected, the congruency effect in the HPC conditions was larger ($M = 105$ ms) than in the LPC conditions ($M = 92$ ms). Importantly, the interaction between Group Congruency and Individual Face Consistency was not significant, $F(1, 32) < 1$. These findings indicate that this congruency effect did not differ for consistent and inconsistent faces. See table 1 for details. A corresponding analysis of error rates, only showed a marginal effect of Group Congruency, $F(1,32)= 3.12$, $p =.087$. Participants showed a higher congruency effect in the LPC (4.6%) as compared with HPC (3.8%). No hint for an interaction between Group Congruency and Individual Face Consistency, $F (1, 32) < 1$.

Again, in order to examine the possibility suggesting that different emotions drive the capture of attention differently (Fox, et al. 2002; Ohman, et al, 2001; Vuilleumier & Shwartz, 2001) we analyzed participants for whom true smiles were associated with a HPC and participants for whom false smiles were associated with a HPC. Specifically, a Smile (True vs. False) by Individual Face Consistency (Category Consistent vs. Category Inconsistent with the group) by Group Congruency (High vs. Low true-false) ANOVA was conducted on the congruency index. A main effect of Group Congruency was found $F(1, 31) = 5.65$, $p = .024$, which was not modulated neither by Face Consistency, $F(1, 31) < 1$, nor by Emotions $F(1, 31) = 1.31$, $p = .26$. That is, regardless of whether true or false smiles were associated with high or low

proportion congruent trials, participants showed higher congruency effects for HPC than LPC contexts.

Discussion

The main goal of Experiment 2 was to examine whether the categorization processes and the allocation of attentional control found in Experiment 1 was due to impressions related to the specific emotion. The results from this study replicated the findings in Experiment 1. Specifically, this study indicates that categorization effects related to emotional expressions as indexed by social-context-specific PCE occur independently of the consistency of the faces. That is, participants apply the same cognitive control to consistent true smiles associated with a HPC and the inconsistent true smile, which was in fact specifically associated with a LPC. The fact that, in this experiment, both emotions were related to happiness and that the main difference between stimuli was perceived trustworthiness, however, indicates that trait impressions rather than specific facial features may underlie these categorization effects.

Experiment 3

The results from Experiment 2 suggest that impressions of trustworthiness guide categorization processes. In particular, rather than relying on individuating information, participants used the impressions they extracted from facial emotions. For pictures of inconsistent individuals, participants' responses were similar to the PCE expected for the proportion congruency associated to the group, not the individual.

In Experiment 3, our goal was to replicate these findings using an alternative set of emotions -- happiness and sadness. These two emotions were chosen because they are often considered to be "opposite" emotions (Russell & Carroll, 1999) and therefore mutually exclusive. When people are sad, they are encouraged to smile and "lighten up", or to be happy. People satisfied with their current life define themselves as feeling happy, while those who evaluate their life as unsatisfactory define themselves as sad (Russell & Carroll, 1999). There are also different facial features associated with happiness and sadness. Happy expression are associated with lower eyelids, cheeks raised and the corners of the lips pulled up, while sad expressions are associated with the medial portion of the eyebrows raised and pulled together, and the corners of the lips pulled down (Ekman,et al. 2002). Given these contrasting physical and emotional characteristics associated with happiness and sadness, models of affect have

conceptualized the both emotions as diametrically opposed (e.g., Larsen & Diener, 1992; Russell & Carroll, 1999; Watson & Tellegen, 1985, 1999) and near the two poles on the valence dimension (Watson & Tellegen, 1985; Watson, Wiese, Vaidya, & Tellegen, 1999). Also, analyses of self-reports confirm that these emotions are negatively correlated (Plutchick, 1980). All together made us predict a clear categorization of these two emotions, given that, as occurred with angry and happy faces, for both facial features, implicit impressions are different between these two emotions. Consequently, this categorization processes would be shown as a higher congruency effect for the emotion associated to HPC, for consistent and inconsistent individual faces.

Method

Participants

Twenty-eight students (18 males) from the Catholic University of Valencia San Vicente Martir (M = 23.5 years) participated in this experiment. All participants were naïve as to the purpose of the study.

Stimulus material, tasks and study design

This study included the same procedure used in Experiment 1, however, the emotional stimuli were now related to eight photographs of women from the Radboud faces database (Langner et al. 2010) each depicting happy and sad faces (see Figure 1, Panel C). Each participant was randomly assigned to one of four counterbalanced groups and presented only with eight of the sixteen photographs. Four of these photographs portrayed happy faces and four portrayed sad faces. In an initial pilot study, a separate group of participants (n = 24) were asked to identify the emotion on each face and to rate faces on trustworthiness using a 1 (not at all trustworthy) to 7 (very trustworthy) Likert scale. Participants correctly identified over 80% of the emotions. Furthermore, a paired t-test demonstrated that participants rated happy (M = 4.63, SD = .98) as significantly more trustworthy than sad faces (M = 3.27, SD = 1.04), t(23) = 4.89, p <.001.

Furthermore, as in Experiments 1 and 2, three consistent members and one inconsistent category member within each of the two contexts (sad and happy faces) were created. Participants performed one practice block consisting of 16 trials followed by five experimental blocks of 128 trials.

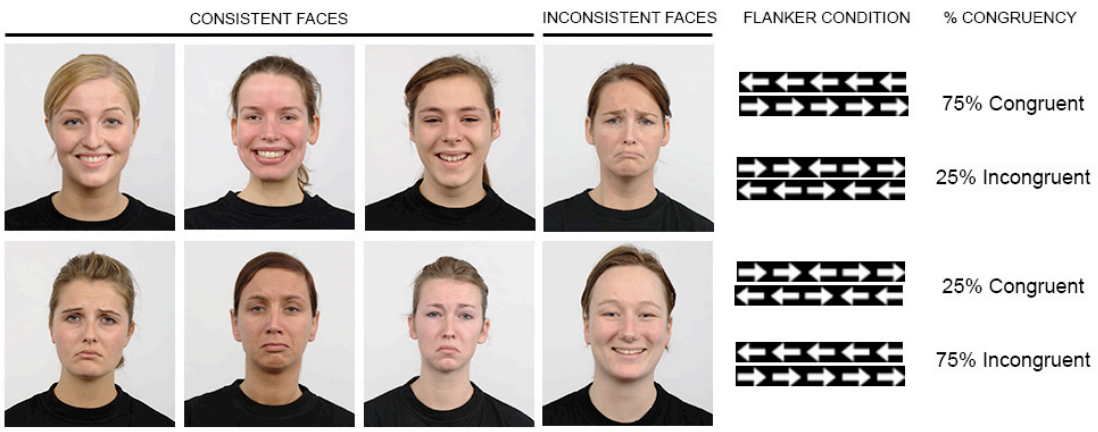

Figure 3: Example of stimuli of happy faces in the High Proportion Congruent condition and sad faces in the Low Proportion Congruent condition.

Results

In accordance with the previous analytic strategy, the data from the practice and first blocks were excluded from the analyses. Furthermore, trials with errors (2 %) or outliers (i.e., response latencies above or below 2.5 SD) (1.2%) were also excluded. Data from three participants with excessive error rates (i.e., large than 20%) were not included.

An index of the congruency effect (incongruent – congruent) was computed and submitted to a repeated measure ANOVA that included Group Congruency (High vs. Low) and Individual Face Consistency (Category consistent vs. Category inconsistent with the group) (see Table 1).

A main effect of Group Congruency was found, $F(1, 27) = 5.72$, $p = .024$. However, in contrast to our earlier results, this congruency effect was smaller, not larger, in the HPC condition (M = 84 ms) than in the LPC condition (M = 96 ms). Furthermore, this main effect was qualified by Face Consistency. Specifically, the two-way interaction was significant $F(1, 27) = 7.42$, $p = .011$. This result suggests that participants processed the faces in an individualized rather than categorized way. While the congruency effect did not differ for consistent faces in HPC and LPC conditions, $F < 1$, (both Ms = 92 ms), the congruency effect was larger for inconsistent faces in the LPC condition (i.e., for a face individually associated to a HPC)(M = 98 ms) than in the

HPC condition (i.e., for a face individually associated to a LPC) (M = 75 ms), $F(1,27)$ = 8.57, p = .007. This pattern of findings is clearly distinct from Experiments 1 and 2.

A corresponding analysis of error rates revealed that Group Congruency was significant, $F(1,27)$= 6.09, p =.020. Again, a larger congruency effect was observed in the LPC condition (3.8%) than in the HPC condition (2.2%). There was no hint for an interaction between Group congruency and Face consistency $F(1,27,)$ = 1.53, p = .23.

As in previous experiments, we evaluated the possibility of differential attentional capture driven by emotions (Fox, et al. 2000; Ohman, et al., 2001; Vuilleumier & Shwartz, 2001). We analyzed participants for whom happy faces were associated with a HPC and participants for whom happy faces were associated with a LPC. Specifically, an Emotion (Happy vs. Sad) by Individual Face Consistency (Category Consistent vs. Category Inconsistent with the group) by Group Congruency (High vs. Low happy-sad) ANOVA was conducted on the congruency index. A main effect of Group Congruency was found $F(1, 26) = 5.54$, p = .026, qualified by Face Consistency, $F(1, 26) = 7.35$, p = .012. However, neither the main effect nor the interaction were modulated by Emotion, Fs (1, 26) < 1.

Table 1. Congruency effect in ms and error rates (in brackets) for Experiments 1, 2, 3, and 3 replicated.

EXPERIMENT		Consistent Faces (CF)				Inconsistent Faces (IF)				Social-context specific PCE (HPC-LPC)			
Experiment 1		**HPC**		**LPC**		**HPC**		**LPC**		**CF**		**IF**	
	Congruency effect (I-C)	85	(2.6)	79	(2.4)	92	(3.1)	80	(3.2)	6	(.2)	12	(-.1)
Experiment 2													
	Congruency effect (I-C)	102	(4.0)	91	(5.0)	107	(3.6)	93	(4.2)	11	(-1)	14	(-.6)
Experiment 3													
	Congruency effect (I-C)	92	(2.3)	92	(3.0)	75	(2.1)	98	(4.4)	0	(-.7)	-23	(-2.3)
Experiment 3r													
	Congruency effect (I-C)	87	(5.3)	92	(5.3)	90	(6.1)	92	(5.5)	-5	0	-2	(.6)

Note: HPC refers to High Proportion Congruent; LPC refers to Low Proportion Congruent; and PCE refers to Proportion Congruent Effect.

Discussion

In contrast to Experiments 1 and 2, participants' responses in this experiment were influenced by the proportion of congruent trials that were associated with each individual face rather than the emotional category. That is, for inconsistent faces, participants showed a congruency effect accordingly with the specific proportion of congruency associated with the individual and not to that associated in general to the emotional category. In accordance with previous results related to individuation instructions (Cañadas et al, in press) and facial familiarity (Cañadas et al., in preparation), these findings indicate that people may not always process faces according to categorical information. In particular, when motivated and able to do so, participants may actually individuate others (Brewer, 1989; Fiske & Neuberg, 1990).

Another study, using different sad and happy faces, with the same manipulation, again fails to show the categorization effect[1]. These inconsistent results between contrasting happy with sad expressions, and contrasting angry with happy expression, or true with false smiles, suggest that there is something specific to the emotions that influences categorization processes. For example, while happy vs. sad may differ in the extent to which they influence ratings of trustworthiness, they may also differ in the

[1] Fifty students (7 males), from the University of Granada participated in the experiment in exchanged for course credits (mean age 21.1 years). The same apparatus and stimuli used in experiment 3 were used here except for the faces that were used. Those were taken from a data-base developped by the first author and contain a faces of young Spanish women in emotionally happy or sad state with a direct gaze. Furthermore, we also created three consistent and one inconsistent category members within each of the two contexts (true and false smiles) as in previous experiments. In order to minimize difference between emotions, the happy and sad faces selected were rated equally in trustworthiness for a sample of 20 independent participants from a total of 12 different models. There was not significant difference in the scores for happy (M=4.7, SD= .4) and sad faces (M= 4.4, SD= .5); $t(19)= 1.55$, $p = .165$

Participants performed one practice block consisting of 16 trials followed by five experimental blocks of 128 trials each. We observed a main effect of congruency $F(1, 49)= 421.30$, $p < .001$. Interestingly, in the ANOVA with the congruency index as dependent variable, the main effect of Group Congruency was not significant. Neither was the interaction with consistency. All F's < 1.

extent to which they focus attention on a specific face stimuli. While angry expressions may lead to the spontaneous trait inference of aggressiveness (Oosterhoof & Todorov, 2008, 2009), this same type of inference may not be related to other emotional expressions such as sadness. Inferences related to sad faces, alternatively, may be more situation and not actor specific. One probably explanation could be that we probably do not infer dispositional traits who express sadness. However, given that we have not found differences between emotions within each experiment we could claim that it must be the case that the categorization-individuation effects driven by these emotions may be due to the specific emotions contrasted.

General Discussion

The present studies investigated whether emotions serve as contextual cues and produce a specific pattern of allocation of attentional control based on inherent fast classifications. While in Experiment 1 we focused on angry vs. happy expressions, in Experiment 3 we included happy vs. sad expressions. Notably, these emotions are opposite in valence, have different facial signs and produce different emotional responses. In Experiment 2, alternatively, we focused on true and false smiles, which in spite of being a similar emotion produce opposite impressions in the perceiver regarding trustworthiness.

The results of to Experiments 1 and 2 indicate that participants were influenced by the emotional category and the proportion of congruency associated to it when allocating attentional resources. Specifically, they used the emotions rather than relying on the individual diagnostic information within each single face. Experiment 3, in contrast, showed that participants were influenced by the individual faces and the proportion of congruency when allocating attentional resources. Specifically, they individualized the targets rather than relying on the emotional categories. In the replication of the Experiment 3 no modulation of the congruency effect was observed, which seems to indicate that participants in this case grouped the 8 faces in a single category (e.g., female).

Therefore, across the 3 experiments a clear pattern emerged: whereas the happy vs. angry faces and true vs. false smile served as a cue to categorize faces according to emotions, the happy vs. sad emotions did not. In the case of happy and sad faces,

participants used the individual rather than the emotional expressions as a context for the allocation of attention.

Notably, the results from Experiment 2 show that the same emotion (happiness) which shares most of the same facial features, but vary uniquely in the intensity of the contraction of some muscles, may produce results indicative of categorization effects. We argue that impressions related to trustworthiness by the participants may underlie these processes.

Interestingly, because in both Experiments 1 and 3 we focused on two opposing emotions (i.e., happy vs. angry and happy vs. sad, respectively), that were related to different facial features and differences in trustworthiness we predicted clear categorization processes in both experiments. To our surprise, only the results in Experiment 1 showed this pattern. The findings in Experiment 3, alternatively, implicated the individuation of faces according to a specific contingency between each face and the proportion of congruency. One possible explanation for these inconsistencies may be that comparisons between angry and happy faces represent a more salient confronting context than sad vs. happy faces. In such a case participants presented with the confrontation angry vs. happy should have found easier to discriminate between the two emotions, while participants with the confrontation sad vs. happy should have used different strategies to allocate control, either at the level of the individuals (Experiment 3) or at the higher level of human faces (replication). Another explanation is that neither facial characteristic of the emotions alone, nor the impressions related to these expressions, in isolation, can determine whether an emotion is used for categorization. Perhaps it is more likely that an interaction between these two factors may be critical (see Adolphs, 2002 for a review).

Another important determinant of the categorization processes might be emotional responses aroused by expressions. In particular, how perceivers react to each emotion, their capability to fully discriminate between them, to embody these emotions, to empathize, and to learn something about the target may play important roles in categorization and individuation processes. It is important to understand that emotions and social contexts serve to facilitate and promote future interactions between people. In this way, emotions are signals to approach or avoid others. Whereas angry expressions may be related to future negative consequences, the implications of sad expressions are

not so obvious. Consequently, anger and not sadness may be related to specific behavioral responses. While angry faces and false smiles may lead to avoidance, sadness may produce a more diverse set of behaviors related to individuating and gaining a better understanding of the actor in an attempt to help the person expressing the emotion.

Future research with different experimental procedures should investigate whether the distinction we have observed between sadness on the one hand, and anger and trustworthiness elicited by true vs. false smiles, on the other hand, extend to other situations. It will be important to investigate whether approach-avoidance behavior elicited by these emotions underlies the tendency to categorize individuals portraying angry faces or false smiles, and to individuate individuals portraying sad faces.

In order to extend our results, future research may productively manipulate or control the emotional state of participants. Clearly, the feelings of the participants may interact either with the perception of the faces presented during the task as well as with the impressions they form during the task. Forgas and East (2008), for example, have demonstrated that participant's mood might play an important role in evaluating genuineness of smiles. While positive mood increased trustworthiness ratings of a happy face, negative mood decreased such judgments. Accordingly it could be interesting in future research to examine the impact of either inducing context-congruent emotions or a neutral state. Notably, recent research has shown that blocking a facial expression inhibits mimicry of perceived emotions and inhibits emotional recognition (Niedenthal et al, 2010).

In conclusion, emotions have largely demonstrated their importance in social interactions: facilitating and favoring communication between peers and determining whether to approach or avoid a person or environment (Harmon-Jones & Segilman, 2001). From a cognitive perspective, emotions have been shown to selectively guide attention. In the present research, we attempt to integrate these literatures by replicating the context-specific PCE with emotional faces as context cues for the allocation of attentional control. Interestingly, these results clearly show that happy vs. angry expression and true vs. false smile, leads to categorization processes along these dimensions. Further investigation, however, is still necessary to clarify why this is not the case for sad vs. happy emotions which lead to more individuated processing.

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EXPERIMENTAL SERIES 3

KNOWLEDGE MODULATES CATEGORIZATION-INDIVIDUATION PROCESSES

Previous Knowledge Modulates Categorization-Individuation Processes in the Allocation of Attentional Control

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Abstract

Dominant models in person perception suggest that when we first encounter a person rapidly and effortlessly categorize and form an impression of her/him. This fast categorization process allows us to interact with this person in the future. Cognitive control has been used recently as a tool to measure social categorization processes underlying the allocation of attentional control (Cañadas, Rodriguez-Bailón, Milliken, and Lupiáñez, in press). It has been shown that gender of faces can be used as context to cue the allocation of control of attention "on line" even generalizing to new items of the same gender category. The present study extends previous work by investigating how previous knowledge of the perceiver modulated these categorization processes. It shows that when participants encounter highly familiar faces or other non-social stimuli, individuation rather than categorization processes seem to operate in allocation of cognitive control. These results support current models on categorization.

In everyday situations people show to be adroit at classifying automatically, and even sometimes unconsciously, objects as well as people (Macrae & Bodenhausen, 2000, Taylor, Fiske, Etcoff, & Ruderman, 1978). Upon encountering a person or an object, perceivers rapidly categorize them on the basis of their salient features and the previous knowledge we have with them. These features can take the form of physical characteristics, such as shape or color; they can be also configuration of behavior or practical use that easily cues a specific category. For instance, if we find a hand tool for cutting wood and similar materials, having a long, thin serrated blade and it operates using a backwards and forwards movement, we rapidly recall its common name "saw". Interestingly, however, if a kid found it, it is likely that he will call it "tool" (for a Hierarchical structure of categories approach see Collins & Quillian, 1969, Shallice, 1988, Warrington, 1975). The kid response is logical because he has no prior experience with this tool and no other information is available.

Likely, the same outcome will occur with people. When we encounter a celebrity's face and we are aware of who he/she is, we will be able to rapidly recall his/her proper name and behave accordingly; however if we do not recognize this famous person, we will apply different category labels such as gender, ethnicity and age, rapidly and effortlessly to judge the person we just encounter (Fiske, 1998).

Understanding Categorization Processes

Human beings try to economize time and resources in order to provide a wealth of information with the least cognitive effort (Macrae, Milne, & Bodenhausen, 1994). To that end, individuals create categories; two or more distinguishable items, which share some attributes, properties, or qualities, which maximize within-category similarity rather than between-category similarity (Mervis & Rosch, 1981; Rosch, 1978). We create categories based on social attributes (e.g. gender, age, etc.) or other kind of attributes shared by exemplars of these categories (shape, weight, etc.) but at the same time we keep specific attributes to identify (individuate) each of the items within a category. Thus, we give proper names to people at birth as well as specific names to inanimate objects (scissors) and other living beings (dogs).

Broadly speaking, categorizing is a process in which we describe and think about other entities as a function of their membership group (e.g., men, animals). It has been shown that this categorical thinking influence the way we evaluate, encode, and respond to target stimuli (Macrae & Bodenhausen, 2000). Individuation, in contrast, reflects the tendency to perceive other people/objects not as members of distinct groups or categories, but rather as unique entities. Interestingly, categorization and individuation processes are jointly determined both by the perceiver's ability to discriminate stimuli and by the stimulus's distinctiveness relative to other within-category exemplars (D'Lauro, Tanaka, & Curran, 2008). Some theorist have proposed that the more specific information we have from the perceived entity, the easier is to retrieve identity diagnostic information from memory (see Macrae & Bodenhausen, 2000; Macrae, Bodenhausen, Scholerscheidt, & Milne, 1999).

The way all the knowledge about a stimuli (i.e., its representation) is stored in memory for each individual has been thought to follow a hierarchical structure of categorization (Colllins & Quillian, 1969) that has been argued to be universal (Berlin, 1992). The basic level of categorization (Tanaka, 2001) is the nexus of perceivers' knowledge about entities, and the level of abstraction where they primarily organize conceptual processing (Grill-Spector & Kanwisher, 2005). The basic level can be thought of as the optimal level for differentiating entities within a category. It is easier to differentiate at the basic level (e.g., dog vs. cat) than at subordinate level (e.g., Persian vs. Siamese), and the superordinate level offers less information about the entity (e.g. animal vs. human being) than the basic level. In sum, the basic level offers the optimal trade-off for maximizing an object's "informativeness" and "distinctiveness" (Murphy & Brownell, 1985). The basic level has been identified as the *entry point* in object recognition—that is, the initial point at which the stimulus is compared with its representation stored in memory (Jolicoeur, Gluck, & Kosslyn, 1984). People are generally faster and more accurate to classify typical entities at the basic level (e.g.,"cat") than to identify them at the subordinate (e.g.,"Persian") and superordinate (e.g."animal") levels (Rosh et al., 1976).

However, several factors may modulate this processing advantage for the basic level of categorization compared to the subordinate or superordinate levels. Some of these factors have to do with structural features to the entity to be categorized, as its

typicality or the degree to which it deviates from the category prototype. It has been shown that the less typical an exemplar is from its category, the more quickly it is categorized at the subordinate level than at the basic level (Jolicoeur et al., 1984). This effect has also been shown when faces are used as stimuli (e.g., Tanaka & Corneille, 2007). Other factors which produce a subordinate-level shift are related to the perceivers, as the level of expertise and familiarity with the category at hand. Experts are as quick to identify entities in their domain of expertise at the subordinate level as at the basic level (Chi, Feltovich, and Glaser, 1981; Dougherty, 1978; Murphy & Wright, 1984; Rosch et al. 1976; Tanaka & Taylor, 1991). Similarly, people are as fast to identify familiar faces at the subordinate level of the individual ("Barak Obama") as they are at the basic level ("human being", Tanaka, 2001).

According to Murphy and Brownell differentiation hypothesis (Murphy & Brownell, 1985), when we encounter a new stimuli there are two factors that determine the level of the category to which this object belongs to, that will be more easily retrieved: informativeness and distinctiveness. The former, is related to the amount of information associated to this stimulus. The later, refers to how different is the stimulus (object/person) from other stimuli at the same level. All together, these two factors serve to define the basic level of categorization for the perceiver within a specific category.

From some memory models it is assumed that recognizing an entity entails comparison judgments of similarity between the new stimulus and the representation at the basic level of categorization we have stored in memory (Brooks, 1978; Gillund & Shiffrin, 1984; Hintzman, 1986, 1988; Komatsu, 1992; Kruschke, 1992; Medin & Schaffer, 1978; and Nosofsky, 1988). Therefore, if we are presented with a group of items which can be segregated into two or more salient subcategories, processing mode may be determined in part by the strength of prior knowledge about the specific items and categories stored in memory. If the set of items can be easily coupled with known categories (e.g., gender) and the individual items are unknown, then it is not surprising to find that category-based processing dominates over identity diagnostic representations (e.g., Doise & Sinclair, 1973; Taylor et al., 1978).

In the present study we attempted to investigate the role of previous knowledge in these implicit social categorization processes, extending recent research carried out in

our laboratory (Cañadas, Rodriguez-Bailón, Milliken, & Lupiáñez, in press). More specifically, we will study how previous knowledge of the perceived individuals modulates whether perceivers use the gender category or the individual information, when the faces of these individuals serve as context for the allocation of attentional control.

Categorization and Attentional Control

Cañadas et al. (in press) used a procedure in which faces of people were used as a context for the allocation of attentional control. In particular, a flanker task was used in which the stimulus arrays (i.e., target and distractors arrows) were presented in the context of faces (irrelevant domain for the flanker task). They manipulated the proportion of congruent trials associated to each gender context. For a given gender context (e.g., male faces) most of the trials were congruent (i.e., the five arrows pointed in the same direction)(High Proportion Congruent condition –HPC-). For the other gender context (e.g., female faces) most of the trials were incongruent (i.e., the central arrow and the four flanking distracters pointed in opposite directions)(Low Proportion Congruent condition –LPC-). For the gender context associated to a HPC condition (male faces in our example) the congruency effect (i.e., the difference in performance between incongruent and congruent trials) was larger than for the gender context (female faces) associated to a LPC condition. These results replicated previous context-specific proportion congruency effects (PCE) (Bugg, Jacoby, & Toth, 2008; Crump et al., 2006; Crump et al., 2008; Crump & Milliken, 2009; Gratton, Coles, & Donchin, 1992; Heinemann, Kunde, & Kiesel, 2009; Lehle & Hubner, 2008; Lowe & Mitterer, 1982; Schmidt, Crump, Cheesman, & Besner, 2007; Vietze & Wendt, 2009; Wendt & Kiesel, 2011; see Bugg & Crump, 2012 for a review).

A key manipulation of Cañadas et al., (in press) was that not all members of the same context category were associated to the same proportion of congruency. They created category inconsistent contexts by associating the opposite proportion of congruency to one member of each category (e.g., three male faces were associated to a high proportion of congruent targets, but the forth male face was associated to a low proportion of congruent targets, i.e., to the proportion of congruency associated to the majority of female faces). Results revealed the same congruency effect for consistent

and inconsistent members withing a category (which were associated to an opposite proportion of congruency). Therefore the results indicate that participants allocated the same attentional control to all targets within a gender category, regardless of the specific proportion of congruency associated to each individual within the category. In other words, they allocated the same attentional control to category consistent and inconsistent faces (the one in a gender group that was associated with an opposite proportion of congruency than the other three members of the same gender group).

These results support the view that social categories are automatically activated, and implicitly used to determine the allocation of attentional control, in the presence of a triggering stimulus, a crucial property of contemporary models of person perception (e.g. Brewer, 1988; Devine, 1989; Fiske & Neuberg, 1990). It is important to take into account that Cañadas et al. (in press) used as context faces of unknown individuals. Consequently, it seems logic to think that when participants do not have other information about the faces but their gender, this attribute become the basic level of categorization, and therefore the fastest to recollect from semantic memory (Brown, 1958; Jolicoeur, et al. 1984; Murphy & Browell, 1985; Murphy & Wisniewski, 1989; Smith et al 1978).

However, as suggested above, familiarity and expertise seem to modulate this basic level of categorization based on the gender when perceiving faces of people. For example, Tanaka (2001) has shown that participants fail to rapidly categorize famous faces (familiar faces for the participants) according to their gender. Participants identified preferably faces of famous people by their name (90% of the time) rather than by the gender category (10%), that is, they chose to identify faces at the specific level of unique identity. This result could resemble in some extent previous findings with dog and bird experts who preferred to use the species (e.g., “cardinal”) and subspecies (e.g., “Terrier”) labels rather than the general category (dog or bird, Tanaka & Taylor, 1991) to group them. On the contrary, non-expert used the superordinate level of the category (e.g., “bird”) to refer to them.

The Current Study

In sum, both familiarity and expertise has been investigated as important factors related of the perceivers that affect the basic level of categorization. In the present paper we aimed to focus on the role of familiarity, and investigate whether it moderates the

categorization-individuation processes underlying the contextual allocation of attentional control as measured in a flanker task (Cañadas et al. in press). To that end we carried out three experiments.

Experiment 1a is a replication of Cañadas et al. (in press) using different photographies of unknown people. In Experiment 1b we used specific items of two very different and common categories (animals -dog, cat, rabbit and sparrow-, and tools -hammer, scissors, screwdriver and handsaw). Note that in this procedure inconsistent items within a category are associated to the opposite porportion of congruency than consistent items. Therefore, if items are individuated (i.e., categrorized at the underordinate level), an opposite proportion congruency effect should be observed for consistent and inconsisten items. However, if items are categorized, the same proportion congruency effect should be observed for consistent and inconsistent items. Therefore this procedure will allow us to evaluate with a different set of non social simuli whether categorization or individuation apply based on the basic level of categorization of these stimuli. We expect that the well known items used in Experiment 1b will represent the basic level of categorization rather than the superordinate level (animal vs. tools) as previously reported (Chi et al, 1981; Dougherty, 1978; Murphy & Wright, 1984; Rosch et al. 76; Tanaka, 2001; Tanaka & Taylor, 1991).

Finally Experiment 2 seeks to investigate whether, according to the Expertise hypothesis (Murphy & Brownwell, 1985; Tanaka & Taylor, 1991; Tanaka, 2001), knowledge of participants about the people that serve as context determines whether the category (men vs. women) or the individual (e.g. the actress Penelope Cruz) serves as context for the allocation of attentional control. We used photographs of familiar celebrities' faces and presented them to a sample of Spanish and American undergraduate students in order to vary the degree of familiarity with the face contexts, keeping constant the images that served as context.

We predicted that if participants' knowledge modulates category retrieval, for those items for which participants have great amount of information, such as animals and tools (Experiment 1b) or familiar faces (Experiment 2), participants basic level of categorization will be at the entity level. Therefore they should show specific congruency effects accordingly to the proportion of congruency specificaly associated to each item (i.e., opposite for consistent and inconsistent items). Therefore, This will

entail participant individuation processes. On the contrary, for those items for which participants have no prior knowledge, such as unknown faces (Experiment 1a) or Spanish celebrities for Americans (Experiment 2) we expected the same congruency effect for consistent and inconsistent items. Participant should apply control according to the proportion of congruency associated to the category regardless the proportion of congruency associated to each entity. This will reflect the participant use of information coming for the group (the proportion of congruency) rather than the individual. Participants behaviour will be interpreted as a fast categorization process.

Experiment 1

Experiment 1 seek to evaluate how participant' previous knowledge about a given stimulus may modulate the categorization processes of context determining the allocation of attentional control. In the current experiments a flanker task was used to measure attentional control. Different contexts (males or females faces in experiment 1a as in Cañadas et al (in press), and tools and animals in Experiment 1b) served in each trial as the context in which a flanker stimulus array was presented. Participants were asked to respond indicating the direction of a central arrow, which was flanked by two arrows in each side. The direction of the flanking arrows could be congruent or incongruent with central target arrow. For half of the participants male faces/tools were associated to a high proportion of congruent trials (HPC), while female faces/animals were associated with a low proportion of congruent trials (LPC). For the other half the association between contexts and proportion of congruency was reversed.

In order to investigate whether contexts are categorized of individualized, we created consistent and inconsistent category members within each of these two general contexts. Thereby, three stimuli of one category (e.g., men/tools) were associated with a HPC trials (consistent stimuli), whereas a fourth stimulus of the same category was associated with a LPC trials (inconsistent stimulus), and vice versa for the other groups.

In general, we expected the congruency effect to depend on the context so that a larger congruency effect (difference between congruent and incongruent condition) will be observed for the contexts associated to a HPC. Critically however, if participants categorize the contexts, the same congruency effect will be observed for consistent and inconsistent items of the category context. In contrast, if participants individuate, the

previous effect will be modulated by consistency, as opposite effects will be observed for consistent and inconsistent members. Specifically we expected to obtain categorization when faces of unknown women and men are used as context (Experiment 1a) and individuation when well-known exemplars of animal-tools are used as context (Experiment 1b).

Method

Participants

64 students (8 males), from the University of Granada (32, Experiment 1a) and from Blaise Pascal University (32, Experiment 1b) participated in the experiment in exchanged for course credits (mean age 20.3 years). All were naïve with respect to the experimental task as well as to the purpose of the study. The local ethics committees approved the study.

Stimulus material, tasks and study design

Stimulus presentation, timing, and data collection were controlled using the E-prime 2.0 software package run on a standard Pentium 4 PC. Stimuli were presented on a 17" computer screen, and for experiment 1a consisted of full color photographs (taken by the first author), each containing a face in an emotionally neutral state with a direct gaze. Eight different photographs were used, four portraying faces of young Spanish men and four portraying faces of young Spanish women (see Figure 1, panel a). While for Experiment 1b the stimuli belonged to one of two different categories: animals or tools (see figure 1, panel b).

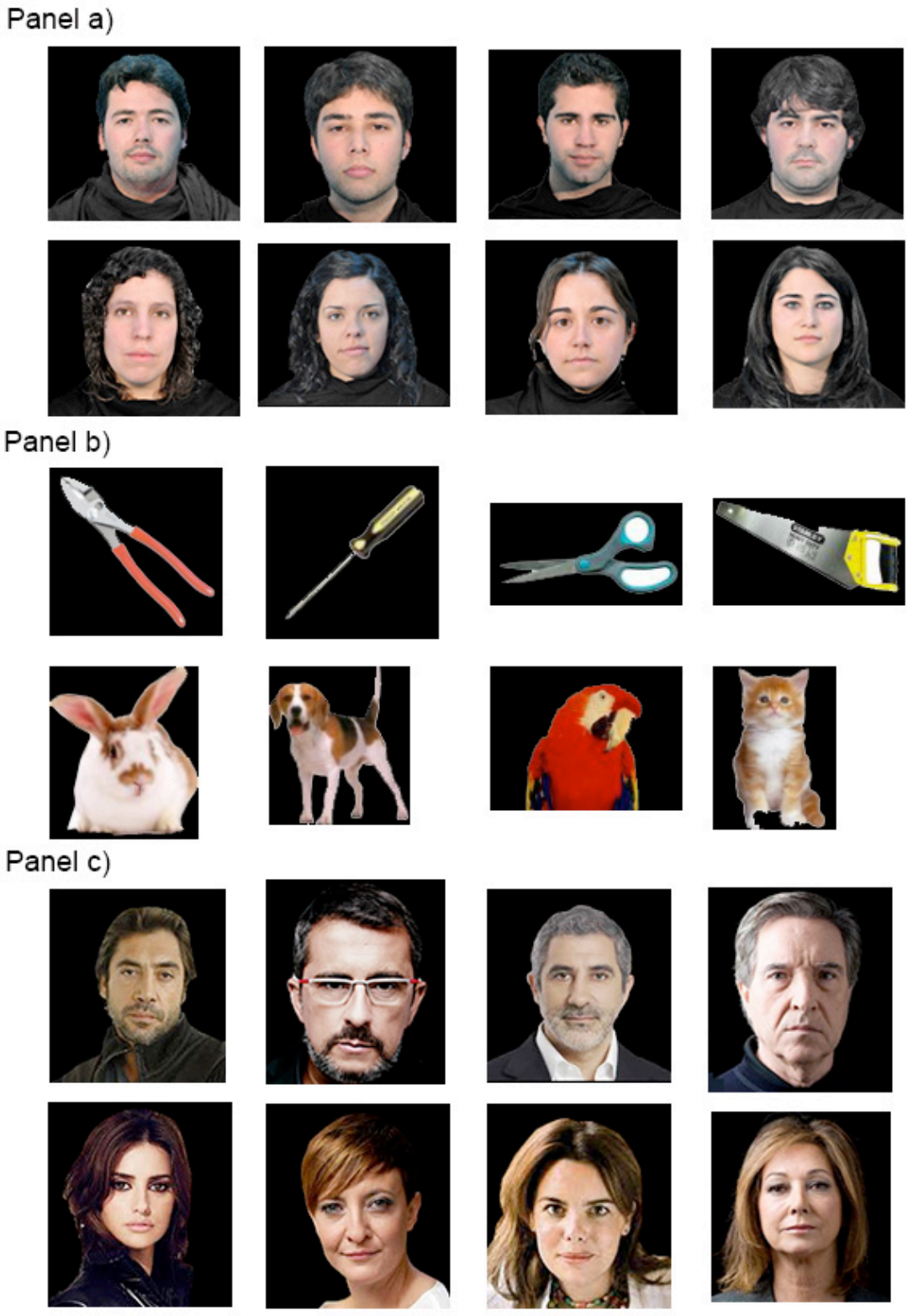

Figure 1: a) Example of stimuli presented. Panel (a) illustrates stimuli from Experiment 1a, Panel (b) illustrates stimuli from Experiment 1b. Panel (c) illustrates stimuli from Experiment 3.

The experiment used a modification of the Eriksen's Flanker task (E.g. Eriksen and Eriksen, 1974). As can be see in Figure 2, each trial consisted of a 200 ms fixation cross followed by central presentation of a stimulus (faces/animal/tool). After a 400 ms interval, five arrows were presented above or below the stimulus for 2000 ms or until response. The stimulus represented the context for the flanker task trial. In the congruent condition, all five arrows pointed in the same direction. In the incongruent condition, the central arrow and the four flanking distracters pointed in opposite directions. Participants were required to respond as quick and accurately as possible to the direction of the central arrow by pressing either the "Z" (left) or "M" (right) key. Participants were instructed to attend to the stimuli, as they would be asked about them at the end of the experiment. The inter-stimulus interval (blank screen) was 1000 ms. Participants were allowed to rest between blocks.

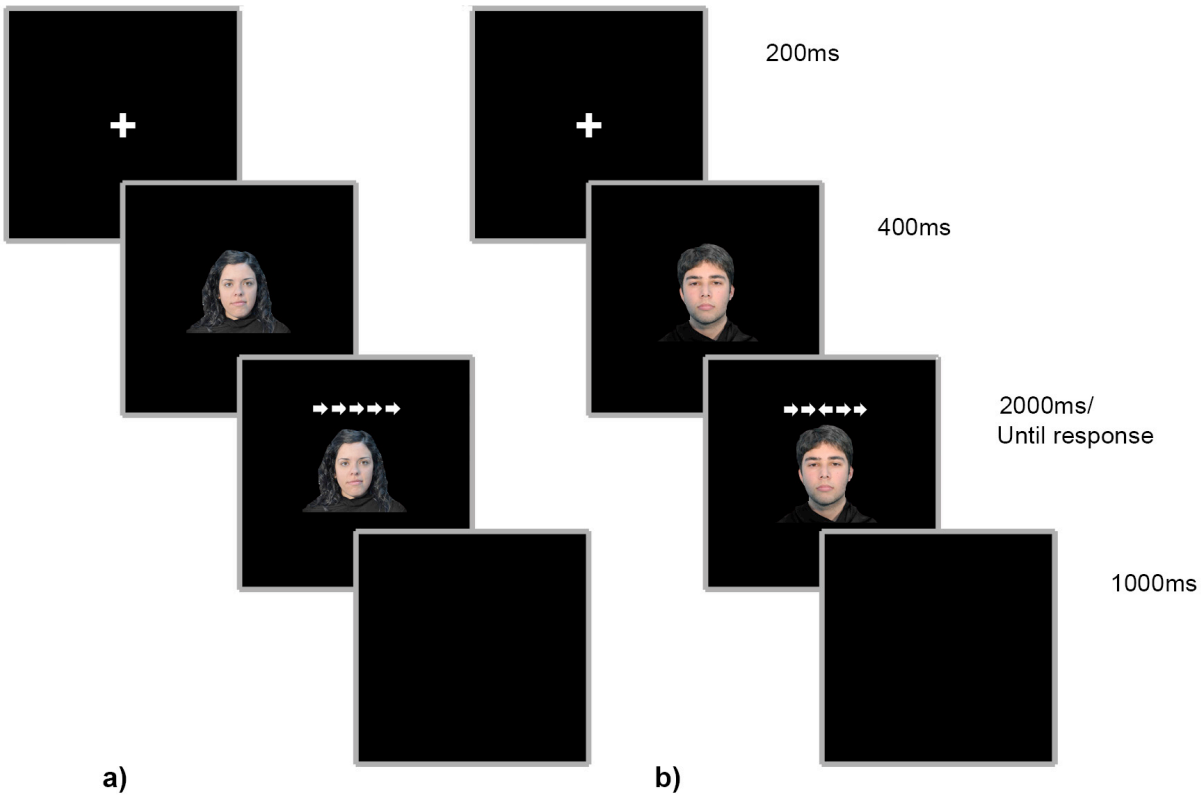

Figure 2: Examples of time course of stimulus presentation in Experiment 1. Panel (a) illustrates a congruent flanker trial, with a female context face. Panel (b) illustrates an incongruent trial, with a male context face.

We used images to create two types of contexts: the individual item (specific face/ specific animal/ specific tool) context, and the category (gender/animals/tools) context. We associated each context to different proportions of congruency within the flanker task. As a result, three stimuli of one group (e.g., men or animals) were associated to HPC (75%) trials (consistent faces or consistent animals), whereas another stimulus of the same group was associated to LPC (25%) trials (e.g. inconsistent face or inconsistent animal). The opposite association was established for the other group. The group and the specific stimulus associated to high or low proportion of arrows congruency was randomly selected and counterbalanced between participants (See Figure 3).

Participants performed one practice block consisting of 16 trials followed by five experimental blocks of 128 trials each. Thus, we used a Congruency (2; Congruent vs. Incongruent) x Group Congruency (2; group context associated to a High vs. Low proportion of congruency) x Individual Item Consistency (2; Category consistent vs. Category inconsistent with the group) repeated measures design.

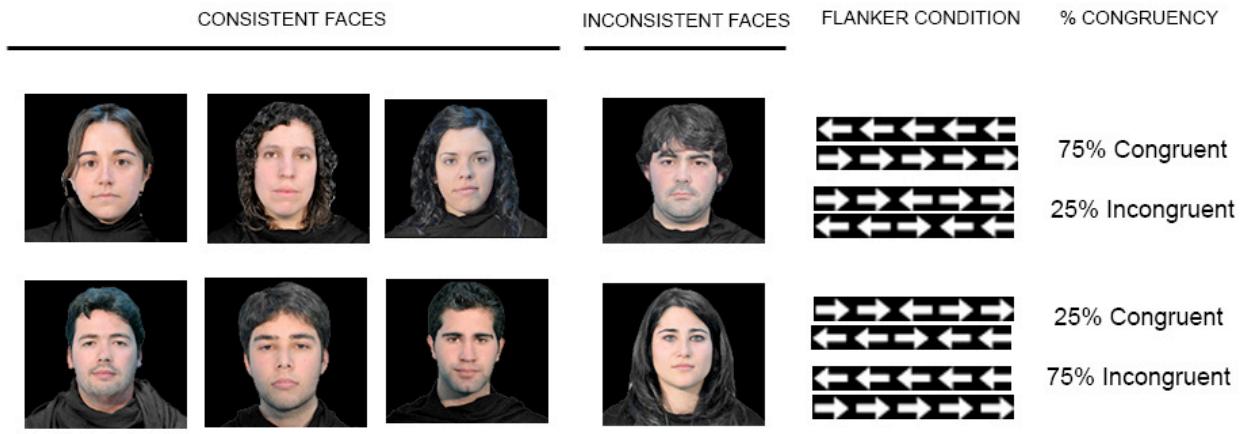

Figure 3: Example of stimuli presented and group congruency manipulation when females were paired with High Proportion Congruent and males with Low Proportion Congruent.

Results Experiment 1a

Practice trials and the first block were not included in the analysis. Erroneous responses trials (ER) (5 %) and correct response trials with Reaction Time (RT) above or below 2.5 SD (1.5%) were eliminated from the RT analyses. Data for one participant were discarded from final analyses due to an error percentage larger than 25%.

Mean RTs were computed with the remaining trials. A first analysis showed a significant main effect of Congruency, $F(1, 30) = 356.12$, $p < .001$, that is, participants took longer to respond to incongruent (637 ms) than to congruent (542 ms) trials. Given the specific hypothesis regarding the modulation of this congruency effect (i.e., mean RT for Incongruent trials – Mean RT for Congruent trials) this index was taken as dependent variable for all the remaining analyses. Congruency indexes for each condition were submitted to a repeated measure ANOVA that included Group Congruency (High vs. Low) and Individual Face Consistency (Consistent vs. Inconsistent with the category) as within-subject variables. Table 1 shows the congruency effect for each experimental condition.

We observed a main effect of Group Congruency $F(1, 30) = 4.69$, $p = .039$. As we expected, the congruency effect for the HPC condition was larger (100ms) than that for the LPC condition (91ms), thus showing a 9 ms social-context-specific PCE.

Importantly, there was no hint for an interaction between Group Congruency and Individual Face Consistency, $F < 1$, showing a similar congruency effect for consistent and inconsistent faces. See table 1 for details. This result replicated previous findings (Cañadas et al. in press) and showed that participants allocated attentional control based on gender categories rather than on individual items.

A corresponding analysis of error rates only showed a significant main effect of Congruency, $F(1,30) = 333.27$, $p < .001$. All remaining F's < 1.

Result Experiment 1b

The same outlier criterion as in Experiment 1a was used. Errors (3%), and RT outliers (1.1%) were excluded from the analyses. Using the same analysis strategy than in previous experiments using a similar procedure, practice and first block of trials were also not considered for the analyses. Data for 3 participants were discarded from final

analyses, one participant due to an ER exceeding 25%, and two participants because they were highly distracted during the experiment[1].

As in the case of Experiment 1a this analysis showed a main effect of Group Congruency $F(1, 28) = 4.88$, $p = .035$. The congruency effect for the HPC condition was smaller (93ms) than that for the LPC condition (101ms). This unusual higher congruency effect in the LPC condition was mainly driven by the congruency effect showed by the inconsistent items (108 ms). See table 1.

Importantly, there was a significant interaction between Group Congruency and Item Consistency ($F(1, 28) = 7.17$, $p = .012$), showing that participants applied cognitive control according to the proportion of congruency associated with each specific item rather its category.

Inconsistent items revealed a significant Group Congruency effect, $F(1,28) = 9.33$, $p = .005$, showing a smaller congruency effect (88 ms) associated to the HPC condition (it is important to bear in mind that these stimuli are inconsistent and therefore, associated to LPC) than for the LPC condition (106 ms). Even though for Consistent items this main effect did not reach significance $F < 1$, they showed a bigger congruency effect for those items when associated to HPC (99 ms) than when associated to LPC (95 ms).

A corresponding analysis of error rates only revealed a significant main effect of Congruency $F(1, 28) = 19.01$, $p < .001$. All remaining F's < 1.

Discussion

The results of Experiment 1a replicated those from Cañadas et al. (in press). They all show a Social context PCE in which similar levels of attentional control seem to be applied to consistent and inconsistent category member. In short, these findings showed that participants categorize the gender of the faces in order to respond to the task at hand. This effect has been assumed to result from cognitive control processes, i.e., to reflect a modulation of selective attention depending on contextual features, the gender of the face in this case.

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[1] They were listening music or talking using their cell phone while doing the task.

From a social perspective, Experiment 1a presents new empirical evidence in favor of incidental person categorization. Mere exposure to faces (task-irrelevant stimuli) seems to be sufficient to trigger categorical thinking, even when the participants' processing goal was not contingent with gender categorization. More generally, these results demonstrate one more instance of social categorization. At least when participants are not motivated to focus on individual features of the faces, they tend to rapidly categorize them using their available physiognomic cues (i.e. features indicative of sex). As a consequence of this categorization, participants tend to activate the stereotype they just created concerning the likelihood of congruency associated to each specific gender. Even when the one inconsistent face was associated to a proportion of congruency (e.g. 75% congruent) opposite to the proportion of congruency (e.g. 25% congruent) associated to three consistent faces of the same gender group.

Given that faces were unfamiliar to the participants they do not have specific semantic knowledge about them apart from their gender group, and therefore the similarity between ingroup members (their physical appearance) became the basic level, as oppose to the new information they had to learn coming from the arrow congruency. Associating that new information (i.e., the proportion of congruency) to the individual face might demand so much cognitive resources that participants avoided doing it and used instead the gender categories to process the pictures. However, it is important to notice that from a social perspective, and in real life, unknown faces become very salient stimuli to process. When we don't have other information but the sex, race, or perceived age (invariant features of person knowledge) they become crucial cues for understanding others, and give information to the perceivers about individual and their group membership (Bruce & Young, 1986).

On the other hand, Experiment 1b aimed at determining how participants' knowledge can modulate the social-context-specific PCE by shifting attention from the category group to the subordinate exemplar basic level. This might consequently lead participant to apply differential attentional control depending on the proportion of congruency associated to each stimulus. This is in fact what happened in Experiment 1b with animals and tools categories, so that participants, rather than applying the same attentional control to consistent and inconsistent stimuli according to the proportion of

congruency associated to their category (animals and tools), they applied specific attention control according to the proportion of congruency specifically associated to each entity.

Thus, results from Experiment 1b replicated in fact the pattern of result observed by Cañadas et al (in press, Experiment 2) when participants were explicitly instructed to individuate. They showed an opposite context-specific PCE for the inconsistent stimuli. This effect reflects that attentional control can also be flexibly and adaptively allocated in response to individual cues. Contrary to Experiment 1a results from Experiment 1b support an individuation process may due to that in this case the basic level of categorization for the set of stimuli used were the specific items (e.g. cat, bird, scissors) and not the category they belong to (i.e., animals and tools).

This pattern of results could be explaining by previous work by Tanaka and Taylor, (1991), showing that participants identify very quickly stimuli by their common name rather than by their category. They explained such result as due to a large amount of knowledge about the items, so that expertise with the stimuli presented allowed participants to retrieve the name faster than the category. However, another possible explanation of previous knowledge comes from the perceptual discriminability of the stimuli (Murphy & Brownell, 1985; Mack, Wong, Gauthier, Tanaka, & Palmeri, 2007). The more knowledge we have about specific exemplars, the easier to discriminate (differentiate) them. From this approach, discriminability is jointly determined both by the perceiver's ability to discriminate stimuli and by the stimulus's structural distinctiveness relative to other within-category exemplars.

In sum, our procedure seems to be useful to measure incidental categorization and individuation processes and the implication of these processes in the contextual allocation of attentional control. Importantly the findings also suggest the role of previous knowledge in these perceptual processes. In the same vein but in the intergroup relations field, experience and knowledge have been associated with having familiarity with a given stimulus target. In essence, the familiarity variability hypothesis assumes a direct effect of interpersonal relations on group-level representations. For example, Linville, Fischer, & Salovey (1989, Experiment 4) demonstrates that "a greater familiarity with the group seems to be enough to lead to greater differentiation

and perceived variability when perceiving the members of a given social group or category" (p. 175).

In the same line, Anaki and Bentin (2009) found that faster identification occured for objects (towers) that are highly familiar to perceivers. They argue that in addition to expertise and typicality, individual familiarity is a determinant that may vary the basic level of object categorization. In their case the specific names of the towers may become the basic level to retrieve information about them because they are sufficiently distinctive and are associated with a large amount of information. Therefore, if the faster access to the stored information seems to drive this effect, by using as context familiar faces which proper names known to participants we should make the entity level faster to access as an entry point. Testing this hypothesis was the goal of Experiment 2.

Experiment 2

According to both the expertise (Tanaka, 2001) and the differentiation hypothesis (Murphy & Brownell, 1985) arguments, familiarity might modulate categorization effects. Consequently, in Experiment 2 we used a procedure similar to that of Experiment 1a and manipulated familiarity of the context faces. A Spanish and American sample was presented with photographs of Spanish celebrities. We expected that for most of the Americans participants those celebrities would be unfamiliar and rarely recognized.

We hypothesized that for Spanish participants, highly familiarized with these celebrities, it will be easy to retrieve the name of the celebrities. As a consequence, a different congruency effect should be expected for consistent and inconsistent faces, as they will individualize rather than categorize the context faces. On the other hand, for American participants the celebrities presented will constitute faces of unknown people, and therefore the gender category will be the basic level of categorization. The same congruency effect will be expected for consistent and inconsistent items, reproducing the social-context-specific PCE observed in Experiment 1a and previously by Cañadas et al. (in press).

Method

Participants

70 students (18 males) with a mean age of 21.4 years, from the University of Granada (41) and from Madison University (29), participated in the experiment in exchanged for course credits. All were naïve with respect to the experimental task as well as to the purpose of the study. The local ethics committee approved the study.

Stimulus material, tasks and study design

Apart for the pictures of faces used everything was the same as in Experiment 1a. Faces of 4 males and 4 females Spanish celebrities were used (Javier Bardem, Penélope Cruz, Iñaki Gabilondo, Ana Rosa Quintana, Andreu Buenafuente, Eva Hache, Gaspar Llamazares, and Soraya Sáenz de Santamaría), from different fields (actors, journalists, tv presenters, and politicians) see figure 1, panel c. They were selected from a large sample of Spanish celebrities, whose exemplars matched in attractiveness, trustworthiness and familiarity, as reported by a different sample of participants. Importantly, as in Experiments 1a and 1b, we created a description of three consistent and one inconsistent category members within each of the two contexts (female and male).

Participants performed one practice block including 16 trials followed by five experimental blocks of 128 trials each. At the end of the experiment participants were asked to report their familiarity with each face in a scale ranging from 1 (not at all familiar) to 7 (highly familiar), in order to use the mean familiarity rate from each participant as a moderator of the social-context-specific PCE. We expect an interaction between familiarity and the social-context-specific PCE that will reflect the differences between those participants reporting high and low familiarity on previous knowledge about the famous faces. For participants for whom the celebrities' displayed were highly familiar (likely Spaniards) individual entities will be more distinctive and informative. Therefore, for those participants it will be likely that the basic level of categorization will be the subordinate one (i.e., their proper name) rather than the gender (superordinate level). The opposite will be true for participants who show low levels of familiarity with the celebrities showed.

Results

Practice trials and the first block were not included in the analysis. Erroneous responses trials (ER) (4.5%), and correct response trials with Reaction Time (RT) above or below 2.5 SD (1.5%) were eliminated from the RT analyses. Data from three participants were discarded from final analyses, two of them due to an error percentage larger than 30%, and the third one due to a RT more than 2.5 SD above the mean.

Mean RTs were computed with the remaining trials, and congruency indexes computed for each condition as in Experiment 1. Congruency indexes were submitted to a repeated measure ANCOVA that included Group Congruency (High vs. Low), and Individual Face Consistency (Category consistent vs. Category inconsistent with the group) as within-subject variables, and Familiarity as a covariate variable. Table 1 shows the congruency effect (incongruent – congruent items) for each experimental condition. We did not find any significant effect; neither Familiarity modulated any of them.

However, a corresponding analysis of error rates revealed a main effect of Group Congruency $F(1, 65) = 5.67$, $p = .020$. The congruency effect for the HPC condition was larger (4.6%) than that for the LPC condition (4.5%). Importantly, this effect was modulated by Familiarity, $F(1,65) = 6.14$, $p = .016$. More interestingly, the interaction between Group Congruency and Individual Face Consistency was significant, $F(1,65) = 5.15$, $p = .027$, and also modulated by Familiarity, $F(1,65) = 6.34$, $p = .006$. See table 1 for details.

In order to clarify this modulation and according to our prediction, we divided participants in three groups as a function of their familiarity ratings (low, middle, high). As it was predicted, Group congruency was modulated by familiarity, $F(2, 64) = 4.47$, $p = .015$. Participants in the Low familiarity group showed a larger congruency effect for HPC (6.3%) compare to LPC (4.9%). However, middle and high familiarity groups showed a reversed pattern, that is, bigger congruency effect for LPC than HPC (3.7% vs. 3.1% for LPC and HPC respectively for middle familiarity; and 5.1 % vs. 4.4% for LPC and HPC respectively for high familiarity).

More importantly, the three-way interaction between Group congruency, Individual Face Consistency and Familiarity (i.e., the 3 familiarity groups) was significant, $F(2, 64) = 6.11$, $p = .004$. For participants in the low familiarity group, the

Group Congruency by Individual Face Consistency interaction was not significant, $F(1, 64) = 2.89$, $p = .094$. Therefore, these participants categorized context faces, as they showed for inconsistent faces the effect expected for consistent ones: a larger congruency effect for the HPC condition (6.4%) than for the LPC condition (3.9%), $F(1, 64) = 6.10$, $p = .016$. However, participants in the high familiarity group did show a clearly significant Group Congruency by Individual Face consistency interaction, $F(1, 64) = 9.93$, $p = .002$. The results revealed participants in this group individuate the context faces as they showed a larger congruency effect for the HPC than for the LPC condition (5.6% vs. 3.9%, respectively) $F(1, 64) = 5.31$, $p = .024$ only for consistent faces. For inconsistent ones, the opposite pattern was found: A larger congruency effect for the LPC (6.2%) than for the HPC (3.2%), $F(1, 64) = 6.72$, $p = .012$[2].

Table 1. Congruency effect in ms and error percentage (in brackets), for Experiments 1a, 1b and 2.

EXPERIMENT		Consistent Faces (CF)				Inconsistent Faces (IF)				Social-context specific PCE (HPC-LPC)	
Experiment 1a		HPC		LPC		HPC		LPC		CF	IF
	Congruency effect (I-C)	102	(6.6)	94	(6.2)	98	(5.9)	88	(6.6)	8 (.4)	10 (- .7)
Experiment 1b											
	Congruency effect (I-C)	99	(4.9)	96	(4.6)	88	(4.8)	106	(4.4)	17 (.3)	-7 (.4)
Experiment 2											
Low Familiarity	Congruency effect (I-C)	96	(6.2)	101	(5.9)	99	(6.4)	97	(3.9)	-5 (.3)	2 (2.5)
Middle Familiarity	Congruency effect (I-C)	84	(3.4)	82	(3.9)	83	(2.8)	73	(3.5)	2 (-.5)	10 (-.7)
High Familiarity	Congruency effect (I-C)	86	(5.6)	87	(3.9)	83	(3.2)	88	(6.2)	-1 (1.7)	-5 (-3)

Note: HPC refers to High Proportion Congruent; LPC refers to Low Proportion Congruent; and PCE refers to Proportion Congruent Effect.

[2] In order to have an overall measure of performance we computed an inverse efficiency index, by dividing the raw RT by the % of accuracy for each condition. We submitted this new index to a Group Congruency x Individual Face Consistency x Familiarity (i.e., the 3 familiarity groups) ANOVA. As expected, the 3-way interaction was significant ($F(2, 64) = 4.42$, $p = .016$). Only participants in the high familiarity group showed a significant interaction between Group Congruency and Individual Face Consistency, $F(1, 64) = 6.62$, $p = .012$ ($p > .13$ for each of the other groups).

Discussion

Experiment 2 provided an initial test of whether the degree of familiarity with the face's context might modulate the categorization-individualization effect over the social-context PCE. Results show that when using celebrities, participants seem to implicitly learn about the association between the task and the context faces, and accordingly perceive them categorically or individually, depending on the degree of familiarity they have with the faces. Therefore, those participants who reported high familiarity with the celebrities individualized faces and therefore applied specific cognitive control according to the proportion of congruency associated with each individual face. On the contrary those participants who acknowledged not knowing the Spanish celebrities categorized them, and consequently applied the same cognitive control to consistent and inconsistent faces.

As occurred in Experiment 1b, higher familiarity rates seem to allow participants to access rapidly the identity of the faces, as indexed by its proper name (e.g. Penélope Cruz) rather than the category level (woman), and this fast access make possible to individualize the stimuli within each category and act accordingly.

General Discussion

The aim of the current studies was to determine whether the amount of knowledge that participants have about a given context determines the Categorization-Individuation processes that modulate the contextual allocation of attentional control (Cañadas et al., in press). Based on semantic memory theories, we studied whether previous knowledge about exemplars determines whether the category or the identity of these exemplars is more accessible. In order to study the modulation of these categorization-individuation processes over the contextual allocation of attentional control we used the procedure developed recently by Cañadas et al (in press), in which consistent and inconsistent category members were used as context for the allocation of attentional control.

We followed the context-specific PCE logic introduced previously by other scholars (Bugg, Jacoby & Toth, 2008; Crump et al., 2006; Crump et al., 2008; Crump & Milliken, 2009; Heinemann, Kunde, & Kiesel, 2009; Lehle & Hugner, 2008; Sarmiento, Shore, Milliken & Sanabria, 2012; Schimdt, Crump, & Besner, 2007; Vietze & Wendt,

2009; Wendt & Kiesel, 2011) to investigate whether different categories (males and females gender faces, tools and animals objects) associated with different proportions of congruency in a flanker task would cue attentional control in different ways, thus modulating the observed congruency effect. In line with previous studies, our results demonstrate that the different contexts that were used are indeed effective cues to control attention, but importantly they do modulate the allocation of attention in different ways. When using faces of unknown people as context, attentional control is allocated on the base of categories (gender); whereas when animals and tools were used as context, participants allocate attentional control as a function of the individual proportion of congruency associated to each specific stimulus.

Specifically, Experiment 1a showed that participants learned the association between gender categories and proportion of congruency, and allocated control accordingly, using the gender category rather than the individual diagnostic information within each single face. The key result from study 1a is that participants allocated the same attentional control to all the targets within a category based on the specific proportion of congruency associated to the consistent members of the category (i.e., to most of the members), rather than based on the proportion specifically associated to each object within the category. That is, for faces of unknown people, participants allocated the same attentional control to category consistent and inconsistent faces stereotyping them. From this perspective, it could be suggested that we created a new stereotype by associating gender of faces to different proportion of congruency, which made participants behave in a more controlled or automatic way according to the social context in which the task was performed. Importantly, we believe this represent a novel example of stereotype knowledge application, as participants transferred to the inconsistent members of the gender group the association acquired for consistent ones.

However, in Experiment 1b, participants allocated different attentional control to category inconsistent animals and tools. Therefore, within the cognitive control literature, whereas results from Experiment 1a support the existence of context-specific modulation over attentional control (Bugg, Jacoby, & Chanani, 2011; Crump & Milliken, 2009), results from Experiment 1b are in line with item-specific learning interpretations (Schmidt & Besner, 2008). Nevertheless, even data from Experiment 1b could be interpreted as context-specific modulation over attentional control, if we

conceive that participants perceived each stimulus (i.e., each animal or tool) as a different context.

In addition, these results support the view that social categories are automatically activated in the presence of a triggering stimulus, a crucial property of contemporary models of person perception (e.g. Brewer & Brown, 1998; Devine, 1989; Fiske & Neuberg, 1990). Importantly, however, our second experiment showed that this effect could be modulated by previous knowledge (familiarity). Specifically, the perceiver information stored in memory about a person could down-shift in the default level of categorization for the familiar faces (celebrities), so that in this case, as in the case of animals and tools, each individual famous face served as specific context for the allocation of attentional control, provided that the celebrities used as context were highly familiar to participants.

According to Smith and Medin (1981) another possible explanation for the categorization-individuation process come from the number of attributes each exemplar shares with the members of their own group. Hence, the higher the physical resemblance between the members of a category the easier and faster the categorization process will occur. With this in mind, for example, in experiment 1b, the resemblance between a dog and a sparrow is smaller than the resemblance between male 1 and male 2 in experiment 1a. Nevertheless, similarity among the four used animals is larger than between the animals and tools.

Furthermore, similarity between group-members was kept constant in experiment 2, which results partially replicated the categorization vs. individuation effects observed in experiment 1a and 1b. This led us to the conclusion that the way we process category exemplar is rather complex and implies more than simply the number of shared attributes. It is important to bear in mind that experiment 2 was almost identical to the experiment 1a, apart from the fact that although we used the same faces for all participants, they were faces of well known people (Spanish celebrities) for most of the Spanish sample, but faces of unknown people for most of the American' participants. Therefore, this procedure allowed us to control perfectly for physical resemblance, and identify familiarity as one important variable producing a shift from categorization to individuation.

In Experiments 1b and 2 (for participants for who the celebrities were highly familiar), participants seems to access first to the identity of each item, which in consequence allow them to behave consequently and apply different cognitive control to Consistent and Inconsistent items. One may argue that for our sample animals and tools (in Experiment 1b) and Celebrities (for Spanish sample in Experiment 2) are to some extend objects of expertise (Tanaka, 2001; Tanaka & Taylor, 1991). In both cases it seems likely that participants easily discriminate among them, what makes this subordinate level their *entry point*.

Therefore, our results are in accordance with the idea that the basic level of categorization must be determined jointly by the perceivers' expertise and familiarity on the one hand, and the structure of the stimulus environment on the other (D'Lauro, Tanaka & Curran, 2008; Murphy & Brownell's, 1985).

Some methodological changes could be introduced in our procedure in order to observe a much clearer dissociation between categorization and individuation when context is used as a cue for the allocation of attentional control. First, in order to show that people knowledge is important for individuation, it would be interesting to test whether using different breeds of dogs and cats as context rather than 4 different animals and 4 different tools (Experiment 1b) a categorization effect will appear through the observed context-specific- PCE. Interestingly, this pattern would only be observed for non expert and not familiarized participants; the opposite individuation effect should be observed if participants were dog and cat experts (e.g., veterinarian or pet lovers). This procedure would also be useful to evaluate the similarity approach (see Brooks, 1978; Komotsu, 1992; Kruschke, 1992; Medin & Scheffer, 1978; Nosofsky, 1988.

Regarding the Experiment 2, we were interested in controlling for any difference between males and females celebrities used on it, controlling for example the jobs they had (, and making sure that the two groups had on average a similar familiarity rate. This process led to the selection of some celebrities not extremely known by the Spanish sample. Consequently we found a weaker effect of familiarity than the one expected by the results of Experiment 1b using animals and tools. Future research should use even more familiar faces (perhaps international celebrities) and associated to a unique profession (e.g., singers), which should improve the individuation effect.

Finally, some studies (e.g., Andersen & Klatzky, 1997; Andersen, Klatzky, & Murray, 1990), showed that stereotypes are used to describe public figures that are familiar but not intimate. In a similar vein, a recent neuroimaging study by Gobbini and Haxby (2007) showed activity in regions that have been associated with the "theory of mind" (APC, TPJ, PCC/PC), with retrieval of episodic memory, and with emotional response in relation to processing of familiar faces. Specifically, these regions were more activated for familiar faces as compared to celebrities and strangers, showing that there must be a difference in face processing according to the type of familiarity. Therefore, it is possible that using intimate acquaintances, may improve the individuation effect showed in Experiment 2.

To summarize, this research serves as an additional evidence of the interrelation between memory, attention and stereotype processes. It shows the relevance of people expertise within a domain, either social or non-social, to modulate the categorization-individuation processes underlying the contextual allocation of attentional control. Clearly, however, further effort is needed in order to construct a more reliable sample of stimuli which will allow a better differentiation between Categorization and Individuation processes. We hope our procedure would be useful as a novel tool to implicitly study stereotype formation and stereotype activation and application.

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RESUMEN DE RESULTADOS

&

DISCUSIÓN GENERAL

RESUMEN DE RESULTADOS

A lo largo de esta tesis hemos encontrado datos suficientes que apoyan la utilidad de las caras en general, y el género y las expresiones emocionales en particular, como clave contextual para distribuir recursos atencionales que nos permitan resolver una tarea conflictiva (v.gr., con interferencias) de la forma más rápida y eficaz posible. Un resultado a destacar del presente trabajo es la generalización de esa distribución de recursos atencionales (tras la asociación con proporciones específicas de congruencia) a las caras inconsistentes con el grupo que hace de contexto, así como a las caras novedosas con las que no se tiene experiencia alguna, y por tanto nada se ha asociado a ellas. Dicha generalización ha sido interpretada como una medida de categorización implícita. Además, hemos contribuido con nuevas evidencias que demuestran que la familiaridad de los estímulos y la motivación del participante a la hora de realizar la tarea pueden ser importantes moduladores de los procesos de categorización.

En la primera serie experimental llevamos a cabo dos experimentos. Nuestro objetivo era estudiar la posibilidad de la utilización de caras como clave contextual para reproducir el efecto de proporción de congruencia específico del contexto. Más concretamente, estábamos interesados en evaluar si el género de las caras produciría una distribución de la atención basada exclusivamente en las características que agrupan a las personas en función de su categoría social. Como segunda meta, nos interesaba estudiar los procesos de generación y utilización de información estereotípica, y por tanto estudiar si la distribución de dicha atención se producía de forma estereotípica o individualizada. Un último objetivo, buscaba determinar el papel de la motivación del participante como modulador de los efectos de categorización.

Con dichos objetivos en mente, desarrollamos un procedimiento (que se aplicó en las tres series experimentales) de modo que determinados miembros de cada categoría (hombres y mujeres) podrían ser consistentes o inconsistentes con su categoría. Más concretamente, asociamos cada categoría con una alta o baja proporción de congruencia en una tarea de flancos, y manipulamos a su vez que para aquellos miembros inconsistentes, la proporción de congruencia asociada correspondiera con la asociada con los miembros de la categoría contraria. Además, en el segundo experimento de la serie, los participantes recibieron instrucciones específicas para

prestar atención a cada cara en particular (individualizar) o a los miembros de cada género (categorizar). Además, en este experimento, incluimos un bloque adicional en el que se presentaban caras nuevas con las que el participante no tenía experiencia previa. En este bloque la proporción de congruencia se equilibró (50%), para no inducir ningún nuevo sesgo de control atencional, más allá del aprendido previamente para el género de las antiguas caras.

Los resultados de los dos experimentos que conforman esta serie experimental aportan una gran evidencia a favor de la utilidad de las caras como claves contextuales para controlar la atención. Así, como previamente habían demostrado otros autores (Bugg et al., 2008; Crump y col., 2006; Lehle y Hübner, 2008; Vietze y Wendt, 2009; Wendt y Kiesel, 2011) aquellos contextos (caras) asociados a una alta proporción de ensayos congruentes mostraban un mayor efecto de congruencia que aquellos asociados a una baja proporción de ensayos congruentes. Además, en referencia a nuestro segundo objetivo, encontramos el mismo efecto de congruencia tanto para caras consistentes como inconsistentes. Este resultado fue interpretado como una generalización a los miembros inconsistentes del aprendizaje asociativo entre la proporción de congruencia y los miembros consistentes, lo que en consecuencia conlleva a la aplicación de la misma estrategia de control atencional. Finalmente, demostramos que la motivación del participante era un modulador importante de estos procesos de categorización implicados en la aplicación de control en función del contexto. De este modo, los resultados indicaron que aquellos participantes que fueron instruidos a individualizar las caras mostraban para las caras inconsistentes el efecto de proporción de congruencia opuesto al observado para su grupo (v.gr., individualizaban las caras), mientras que aquellos instruidos a categorizar mostraban la misma modulación para las caras consistentes e inconsistentes (v.gr., categorizaban las caras).

En la segunda serie experimental, evaluamos si las expresiones faciales podrían servir igualmente de clave contextual para distribuir el control atencional. Más concretamente, queríamos saber si la impresión que el perceptor se forma sobre la fiabilidad la cara en función de su expresión emocional puede modular los efectos de categorización. Para ello, siguiendo el mismo procedimiento que en la serie anterior, comparamos diferentes emociones, caras de ira vs. felicidad, caras con sonrisas falsas vs. verdaderas, caras felices vs. tristes (Experimentos 1, 2 y 3, respectivamente). Además, este procedimiento nos permitiría a su vez evaluar en qué medida se

generalizaba el aprendizaje sobre los miembros consistentes de un grupo (emoción) a los miembros inconsistentes de ese mismo grupo (v.gr., sólo tres de las cuatro caras de cada grupo de emoción se asociaron a una misma proporción de congruencia).

Los resultados mostraron que mientras que para aquellas emociones utilizadas en los Experimentos 1 y 2 (caras de ira vs. felicidad y sonrisas falsas vs. sonrisas verdaderas, respectivamente) se reproduce el efecto de proporción de congruencia específico al contexto y que éste se generaliza a las caras inconsistentes, este no es el caso para las caras felices vs. a las tristes. En otras palabras, mientras las caras se categorizaban en la dimensión felicidad – ira, o sonrisa verdadera – falsa, más bien se individualizaban cuando la dicotomía de agrupamiento era felicidad – alegría.

Por último, en la tercera serie experimental planteamos la posibilidad de que las características del perceptor, más concretamente el concimiento previo, es decir la información semántica que el participante tiene sobre los estímulos que hacen de contexto, fueran en parte responsables de la generación de los efectos de categorización. Pensamos que el conocimiento previo podría ser un factor que, al igual que la motivación del participante para individualizar, modulara los procesos de categorización-individualización de forma que el efecto de proporción de congruencia específico al contexto fuera igual o diferente para los miembros consistentes e inconsistentes en función de la familiaridad: a más conocimiento previo (v.gr., familiaridad) mayor efecto de individualización esperábamos encontrar. Para demostrar nuestra hipótesis, se utilizó exactamente el mismo procedimiento pero cambiando los estímulos empleados. En un primer experimento, y con objetivo de replicar los hallazgos encontrados en la serie experimental previa, utilizamos otras caras no familiares también fácilmente diferenciadas por la categoría, género. En un segundo experimento, utilizamos animales y herramientas, también fácilmente identificables por los participantes como miembros de su categoría. Sin embargo, en este caso los estímulos son tan familiares para los participantes que esperábamos que su nivel básico de categorización fuera el individuo (p.ej., perro) antes que su categoría de pertenencia (v.gr., animal). Finalmente, en un tercer experimento utilizamos caras de personajes famosos, evaluando a su vez la familiaridad con la que los participantes reconocían dichas caras.

Los resultados del experimento 1 replican los encontrados en las series experimentales anteriores. Por lo tanto, el efecto de conflicto encontrado para las caras

consistentes de cada grupo, en función de la proporción de congruencia que llevara asociada, fue transferido a las caras inconsistentes de cada grupo. Sin embargo, cuando los estímulos utilizados fueron animales y herramientas, así como cuando los participantes evaluaron las caras como altamente familiares, el patrón de resultados es muy distinto. En este caso, se observa que el efecto de conflicto para cada ítem depende exclusivamente de la proporción de congruencia con la que estuviera específicamente asociado. Sin embargo, es importante resaltar que aquellos participantes que no reconocían las caras de los famosos, mostraban el mismo patrón de resultados que los participantes del experimento 1, donde las caras no eran familiares.

A continuación, discutiremos algunas de las implicaciones teóricas de estos resultados abordando la discusión desde dos perspectivas diferentes. Desde una perspectiva más cognitiva discutiremos la importancia de nuestros datos, que apoyan los efectos del contexto como clave de control atencional, mostrando así evidencia en contra de explicaciones teóricas alternativas, que se han presentado en la literatura sobre control atencional. Desde una perspectiva más social, se discutirá la relevancia de los datos obtenidos en el estudio de la generación y aplicación de esterotipos. Planteamos la posibilidad de que el procedimiento que hemos desarrollado en esta tesis pueda ser utilizada como herramienta para investigar los procesos de categorización social y la generación y aplicación de estereotipos (entendidos éstos en un sentido amplio, y sin su carácter cultural compartido).

DISCUSIÓN GENERAL

Esta tesis doctoral profundiza en los procesos mediante los cuales el contexto actúa como modulador de la aplicación de control cognitivo en la ejecución de tareas demandantes de atención. Además, estudiando los patrones de control que los individuos utilizan, analiza cómo estos pueden estar a la base de los procesos de categorización e individualización social, subyacentes en la formación y la aplicación de estereotipos (véase Bugg y Crump, 2012, para una revisión).

En situaciones de la vida diaria, cuando nos encontramos en contextos donde no tenemos una especial motivación por conocer a los demás (p.ej., al asistir a un evento deportivo) nos dejamos llevar por los rasgos asociados a las categorías sociales para formarnos impresiones de las personas que percibimos. Por el contrario, al encontrarnos en un contexto dónde prevemos que será importante la elección de compañeros porque tendremos que interactuar con ellos en el futuro (p.ej., nuestro primer día de clase) inhibiremos la rápida activación de la categoría a fin de conseguir formarnos una impresión pormenorizada de las personas.

Es importante aclarar la forma como conceptuamos el contexto en nuestra investigación. Éste es normalmente entendido como un entorno físico o de situación donde tiene lugar un evento. Así, en nuestro diseño experimental, las rostros se convierten en contexto al ser el entorno donde tenía lugar la tarea que debía realizar el participante. Por tanto, si el participante determina que dichos rostros son relevantes para la tarea, los procesará de forma más detalla que si por el contrario piensa que son irrelevantes para la misma. En cualquier caso, es de esperar que procese al menos su presencia y de forma implícita los asocie con diferentes aspectos de la propia tarea.

Haciendo una trasposición de estas situaciones que tienen lugar en el mundo real al laboratorio, las investigaciones que se presentan en esta tesis analizan la importancia del contexto como modulador de los procesos de control sobre el comportamiento, mostrando que los individuos tienen la capacidad de percibir a otras personas de forma automática y flexible en función del contexto en la que esta percepción se lleva a cabo.

Para ello, utilizando el procedimiento de proporción de congruencia específico al contexto (Crump, Gong, y Milliken, 2006), se ha demostrado que aquellos contextos asociados a una alta proporción de congruencia elicitan un menor control atencional que

aquellos asociados a baja proporción de congruencia. En consecuencia, la aparición de ensayos aislados incongruentes en el primero de los contextos, conllevaría un mayor efecto de congruencia (mayor interferencia; medida como la diferencia TR/tasa de errores asociado a ensayos incongruentes – el TR/tasa de errores asociada a ensayos congruentes) que en la aparición aislada de ensayos congruentes en contextos asociados a baja proporción de congruencia. Esto permite concluir que el contexto sirve como clave contextual para aplicar control de forma flexible. De forma automática, el contexto lleva a la activación de más o menso recursos de control cognitivo, lo que determina el consecuente efecto de congruencia observado.

Además, una reciente aportación a la literatura del control atencional (Crump y Milliken, 2009) mostraba que la información proveniente de las claves contextuales se transfiere a elementos (estímulos) con los que el participante no ha tenido experiencia previa por el simple hecho de ser presentados en contextos para los que existe un aprendizaje asociado. Esto es, una vez que los individuos han asociado que unos determinados contextos requieren más control que otros, con un conjunto de estímulos dados, son capaces de generalizar ese aprendizaje a nuevos estímulos que aparecen en esos dos contextos bien diferenciados.

Al igual que los ambientes, las personas pueden ser consideradas contextos que son utilizados como claves para regular nuestro comportamiento. Tanto el ambiente físico que nos rodea como las personas que nos encontramos en él son fuente de una cantidad ingente de información que por razones de capacidad de almacenamiento, de recursos disponibles, así como por economía temporal somos incapaces de procesar en su totalidad. Sin embargo, cada contexto proporciona una información muy valiosa y relevante no sólo para nuestro cometido actual, sino también en el futuro (p.ej., en la predicción de la reacción del comportamiento de las personas). Por tanto, el procesamiento de la información proveniente tanto de contextos ambientales como sociales parece estar estrechamente relacionado con las capacidades atencionales y especialmente con la habilidad para distinguir entre la información relevante y la secundaria.

Investigar la manera en la que se lleva a cabo el procesamiento de la información contextual de forma automática ante contextos sociales (utilizando para ello rostros de personas) fue el objetivo principal de nuestra investigación. Así, los

estudios presentados profundizan en los procesos de categorización e individualización que tienen lugar en la percepción de personas. La categorización está a la base de los procesos de estereotipia (Tajfel, 1981). En este tipo de procesamiento, se generalizan atributos y actitudes a los miembros de una categoría social. Desde la aproximación cognitiva, la categorización y la estereotipia responden a la necesidad de simplificación que permitirá un ahorro de recursos cognitivos para otras posibles tareas que así lo demanden. Por su parte, la individualización hace referencia a la especificidad en la percepción de cada individuo, en la que incorporamos la información concreta sobre él, independientemente de su grupo de pertenencia. Como cabe esperar, dicho procesamiento individualizado requiere más recursos cognitivos disponibles (Mason, 2004).

Con la finalidad de clarificar estas cuestiones, llevamos a cabo tres series experimentales cuyos resultados más relevantes son expuestos a continuación. En su conjunto, los resultados derivados de los diferentes experimentos muestran el uso efectivo de las caras y las expresiones emocionales como claves contextuales para distribuir recursos atencionales que permiten a las personas resolver de forma rápida y eficaz tareas demandantes de control atencional. Además, hemos demostrado que el procesamiento de los estímulos que hacen de contexto se lleva a cabo en general y por defecto de forma categórica, pero puede ser modulado fundamentalmente por las características del perceptor; entre ellas, por su motivación para tratar de forma individualizada a las personas (Experimento 2, Serie experimental 1), en función de la impresión que el perceptor se forma de ellas (Serie experimental 2), así como por el conocimiento previo o la familiaridad que el perceptor tiene de la persona percibida (Serie experimental 3). Sin embargo, no podemos negar que la singularidad o tipicidad de los estímulos, que los hace más o menos característicos dentro de la categoría a la que pertenecen o altamente diferenciados entre sí, pueden facilitar el procesamiento individualizado de los mismos por parte del perceptor (Experimento 1b, Serie experimental 3).

En este último capítulo presentamos un resumen de los resultados que serán discutidos desde los marcos teóricos conceptuales que consideramos más útiles para ello, no siguiendo necesariamente el orden establecido por las Series experimentales. De

este modo, desarrollaremos de forma más general las discusiones expuestas previamente en cada experimento específico, de acuerdo a los dos ejes fundamentales a los que consideramos que la tesis doctoral puede contribuir: Modulación contextual del control atencional y Control atencional y Procesos de categorización e individualización.

1. Modulación contextual del control atencional

El estudio del control cognitivo, como hemos desarrollado previamente en la introducción, ha sido objeto de amplia investigación desde los años 70. Sin embargo sigue existiendo un gran debate acerca de los mecanismos por los que se lleva a cabo dicho control. Incluso se ha llegado a plantear si necesariamente están implicados procesos de control o se trata simplemente de un aprendizaje asociativo estímulo-respuesta (del inglés, stimulus-response -S-R-).

Mediante nuestro procedimiento ponemos de manifiesto que el efecto de proporción de congruencia no puede ser debido a un simple aprendizaje asociativo S-R (Hommel, 2004; Logan, 1988;). Los rostros inconsistentes con la categoría social a la que pertenecían, pesar de estar individualmente asociados a la proporción de congruencia propia del otro grupo o contexto, muestran el mismo efecto de congruencia que los rostros consistentes, y por tanto a ambos se aplicaba el mismo control que al resto de rostros que presentaban una proporción de congruencia consistente con su categoría social. Además, es importante resaltar que ni el rostro, como entidad unitaria, ni el contexto, como categoría, fueron asociados con mayor probabilidad a una respuesta concreta (izquierda o derecha) que a otra. Siendo éste último uno de los requisitos para hablar de un procesamiento basado en un aprendizaje de contingencias S-R, contrapuesto a la hipótesis del contexto como clave de control (Schmid y Besner, 2008). Otra dato en contra de la explicación de los resultados encontrados como un mero aprendizaje asociativo proviene de la transferencia del efecto de proporción de congruencia a estímulos nuevos (que no han sido asociados a ninguna proporción de congruencia) observado en el Experimento 2 (Serie experimental 1).

Resultados similares fueron hallados recientemente (Bugg, Jacoby y Chanani, 2011) utilizando una tarea tipo Stroop donde se manipulaba la asociación palabra-imagen de modo que esta asociación fuera congruente e incongruente. Concretamente, en estos estudios los autores utilizaban cuatro palabras de animales y cuatro imágenes representativas de dichos animales. Emparejaban los animales dos a dos (i.e. pájaro y

gato por una parte, y perro y pez por otra). La tarea de los participantes consistía en nombrar la palabra inserta dentro de la imagen en cada ensayo. Se manipuló la proporción de congruencia asociada a los pares de animales, de forma que uno de ellos se asoció a una alta proporción de ensayos congruentes (HPC, la palabra estaba escrita en el dibujo que representaba al mismo animal) y el otro conjunto a baja proporción de ensayos congruentes (LPC, en este caso la mayor parte de los ensayos estaban formados por imágenes de animales que no correspondían con la palabra que aparecía junto a ellas). Además los autores incluyeron un bloque adicional, donde los estímulos utilizados en la fase inicial se presentaban entremezclados con nuevas imágenes de los mismos animales, pero que no estaban asociadas a ningún tipo de proporción de congruencia (50%). Los resultados de este estudio mostraron que para aquellos pares de animales asociados a HPC el efecto de congruencia fue mayor que para el par asociado a LPC. Además, mostraron que incluso para esos estímulos no asociados a una proporción de congruencia específica, se transfería la asociada al conjunto de ítems de la misma categoría. Por tanto, tanto nuestros resultados con miembros inconsistentes dentro de la categoría (miembros no estereotípicos de esa categoría social) como con cara novedosas, junto a los resultados de Bugg y col. (2011), parecen no apoyar una explicación que se base únicamente en un aprendizaje S-R (i.e. de contigencias). De haber sido de otra forma, no deberíamos haber encontrado la transferencia del efecto de congruencia revelado en estos dos estudios.

En esta misma línea, pero desde la neurociencia cognitiva, se ha mostrado en un estudio reciente (King, Korb, y Egner, 2012) datos a favor del papel del contexto como modulador del control atencional. Mediante técnicas de resonancia magnética funcional, se ha demostrado que áreas estrechamente vinculadas en la literatura con el control atencional, concretamente el córtex parietal superior medial (mSPL) (veáse, Bunge, Dudukovic, Thomason, Vaidya, y Gabrieli, 2002; Carter, y col. ,1998; Esterman, Chiu, Tamber-Rosenau, y Yantis, 2009) es susceptible de modulación debido a variaciones contextuales al procesar el conflicto. En el estudio referido, los participantes realizaban una tarea de flancos para medir interferencia, y se usaba como contexto el lugar donde se presentaba el target rodeado por los estímulos distractores. Los estímulos podían presentarse a la izquierda o a la derecha del punto de fijación central, y se asoció cada localización a una diferente proporción de congruencia (HPC vs. LPC) de forma

contrabalanceada. La activación cerebral de los participantes durante la realización de la tarea era medida mediante resonancia magnética funcional.

Por un lado los datos comportamentales replicaban el efecto de la proporción de congruencia específico al contexto, mostrando un mayor efecto de congruencia (esto es, menor control atencional) en los contextos asociados a HPC en comparación con aquellos asociados a LPC. Los datos neurofisiológicos por su parte, mostraban la relación entre el córtex parietal superior medial derecho (mSPL) y las variaciones contextuales al procesar el conflicto. Además, este área estaba estrechamente ligada con la la modulación de la activación de áreas del córtex visual encargadas de procesar información relevante para la tarea, indicando que estructuras parietales y occipitales están fuertemente implicadas en las diferencias en resolución de conflicto entre los contexto de alta y baja proporción de congruencia. Todos estos datos en su conjunto muestran que la especificidad del contexto y su modulación del conflicto se lleva a cabo siguiendo un procesamiento de arriba-a-abajo, y por tanto controlado. Además, revelaron un dato de gran importancia, al mostrar que el control no se debía a una focalización sostenida en los contextos asociados a LPC (y por tanto altamente conflictivos y demandantes de control) sino que mostraron que la atención se dirigía de forma "automática" en función del tipo de ensayo presentado y por tanto se producía una adaptación online del control atencional. Juntos estos resultados ponen de manifiesto que el contexto lleva a cabo una distribución de los recursos atencionales de forma rápida y controlada, lo que rechaza la clara dicotomía entre procesos controlados y automáticos existente en la literatura tradicional sobre procesos de control cognitivo (Scheider y Shiffrin, 1977; Norman y Shallice, 1986).

Las investigaciones recientes centradas en la atención endógena encargada de modular el procesamiento visual dirigirlo hacia los objetos en base a su categoría o a su identidad idiosincrásica (véase Lauwereyns, 1998) han intentado explicar ésta como expectativa atencional. Algunas teorías proponen que las expectativas limitarían el número de representaciones perceptivas que se activan al percibir un objeto facilitando por tanto la identificación (Bar, 2003). Desde esta perspectiva teórica se propone que el procesamiento de control que se lleva a cabo para activar o inhibir las distintas representaciones se implementaría de forma controlada, mediante una modulación de arriba-a-abajo, de acuerdo igualmente con nuestros resultados. De ahí, que sea importante resaltar el hecho de que nuestros contextos fueran presentados 400 ms antes

de la presentación de la tarea de flancos. Esto podría inducir al lector a pensar que el participante podría de algún modo tener tiempo para preparar una estrategia de respuesta; sin embargo, la réplica del Experimento 1 (ver nota al pie, Serie experimental 1) dónde se presentaba de forma simultánea la cara que hace de contexto junto con la tarea de flancos sin previa exposición de la cara en solitario, reflejó resultados similares, no habiendo diferencias significativas entre los experimentos. Este resultado, cuestiona la posibilidad de que los participantes crearan algún tipo de expectativa que les ayudara a responder a la tarea en función de la cara presentada (cf. Braver, Gray, y Burgess 2007), aportando más evidencia a favor de que es el control contextual el que subyace al efecto de proporción de congruencia encontrado.

No podemos negar la posibilidad de que los participantes utilicen estrategias de aprendizaje implícito que les permitan de forma rápida y eficaz realizar la tarea, en especial en aquellos ensayos congruentes con la proporción de congruencia asociada a cada contexto. Sin embargo, al ser explícitamente preguntados al final de la prueba, ninguno de los participantes informó estar llevando a cabo estrategia alguna, ya que no advirtieron la existencia de una relación entre los contextos contrastados (géneros/emociones/tipos de objetos) y la tarea de flancos que justificara la necesidad de llevarla a cabo. Sería por tanto necesario idear algún tipo de tarea control, en la que el participante tenga que tomar una decisión sobre si el contexto estaba asociado a una alta o baja proporción de congruencia. Esto nos permitiría evaluar si aquellos participantes que acertaron por encima del azar la asociación contexto/proporción de congruencia obtienen resultados diferentes. Sin embargo, en una investigación reciente de King y colaboradores (2012) informaron explícitamente a los participantes de la manipulación de congruencia de los contextos, encontrando que los participantes seguían reproduciendo el efecto de proporción de congruencia específico al contexto, con independencia de que fueran conscientes o no de al asociación entre el contexto y una proporción de congruencia particular.

2. Control atencional y Procesos de categorización e individualización

Los resultados en los Experimentos 1 y 2 (Serie experimental 1), 1a y 2 (Serie experimental 2) y 1 y 3 (Serie experimental 3 –condición de baja familiaridad-) muestran que los individuos aplican el mismo control cognitivo a los rostros de personas que presentan una proporción de congruencia similar a la de la mayoría de los

miembros que pertenecían a una determinada categoría social (v.gr., rostros consistentes con la categoría) que a los rostros que presentaban una proporción de congruencia diferente a la del resto de miembros de su misma categoría (v.gr., inconsistentes). Del mismo modo, en el Experimento 2 de la Serie experimental 1, se encontró que los participantes aprendieron a utilizar este control cognitivo categorial a otros rostros nuevos de las mismas categorías sociales previas (v.gr., mujeres y hombres). Así, el procedimiento utilizado permite determinar si los participantes aprenden implícitamente que existe una relación entre una determinada proporción de congruencia y los rostros presentados. En consecuencia también aprenden a actuar aplicando un mayor o menor control atencional con cada rostro, lo que nos permitió a su vez evaluar si ese aprendizaje se aplicaba indistintamente a todos los miembros del grupo (*categorización*) o no (*individualización*).

En nuestra investigación mostramos que la motivación para individualizar, a través de instrucciones claras para atender a cada individuo en lugar de atender a la categoría género, puede conllevar el fallo en transferir el efecto de proporción de congruencia a las caras inconsistentes, y por tanto, aplicar una estrategia para resolver la tarea específica a la proporción de congruencia asociada a cada estímulo invidivual. En el experimento 2 de la Serie experimental 1 se pone de manifiesto por tanto, en la misma dirección que los resultados de otras investigaciones previas (Hugenberg, Miller y Claypool, 2007), que primar a los participantes con las instrucción de percibir los rostros presentados de forma individualizada es suficiente para modular el efecto de categorización encontrado por defecto.

Otro factor que ha resultado ser especialmente relevante para romper con la categorización es la familiaridad con los objetivos de la percepción o el conocimiento previo del perceptor. Un mayor conocimiento facilitaría al perceptor alcanzar el nivel de procesamiento del individuo al disponer de información que le permite recuperar los atributos identificativos de la persona percibida. Por el contrario, una menor cantidad de información conllevaría a un rápido acceso a la información referente a la categoría de pertenencia. Por tanto, como se ha demostrado en la Serie experimental 3, y de acuerdo tanto a las hipótesis de singularidad de los estímulos ("Differentiation"; Murphy y Brownell, 1985) y de la experiencia ("Expertise"; Tanaka, 2001) parece lógico pensar que cuando el perceptor no tienen otra información accesible sobre los estímulos percibidos excepto su categoría (tanto social como no social) éstos sean procesados a

nivel categórico. Esta nueva información se generalizará a los miembros del grupo y llevará a actuar a los perceptores en consecuencia. De un modo opuesto, cuando el perceptor dispone de una gran cantidad de información accesible sobre el estímulo percibido, recupera su identidad rápidamente y le incorporará el nuevo aprendizaje de forma individual.

En esta línea, otra aportación relevante de esta tesis es la demostración de los procesos de categorización de emociones de forma implícita. Así, la Serie experimental 2 pone de manifiesto, mediante el mismo procedimiento experimental, que se aplica el mismo tipo de control atencional a caras que muestran las mismas emociones incluso con manipulaciones tan sutiles como la realizada en el Experimento 2 de dicha serie, donde manipulamos la presencia o ausencia de los marcadores faciales indicadores de fiabilidad en la sonrisa (Duchenne, 1990). Esta sutil manipulación nos sirvió para evidenciar la posibilidad de que las impresiones que el participante se forma al percibir una emoción, la fiabilidad, pueden estar a la base de procesos de categorización. Consideramos que estos datos son novedosos y equiparan los procesos de categorización emocionales a los hasta ahora clásicos procesos de categorización de género y raza.

Es interesante (y potencialmente muy relevante), sin embargo, que cuando los participantes eran presentados con emociones, a priori fácilmente distinguibles, como son las caras alegres vs. tristes, los resultados no son muy claros. Esto puede ser posiblemente debido a una dificultad por parte de los estímulos utilizados para evocar una respuesta emocional en los participantes. No obstante, los resultados con la emoción de tristeza vs. alegría, deben ser tomados con cautela. Sería conveniente replicar estos resultados en investigaciones futuras para determinar la causa de la imposibilidad de producir el efecto de proporción de congruencia específico al contexto con rostros de tristeza.

Recientemente, se ha demostrado que todas las claves no son igualmente efectivas para producir el efecto de proporción de congruencia específico del contexto (p.ej., la forma de los objetos sobre los que se presenta la tarea, en los experimentos de Crump, y col., 2006, o Crump, y col., 2008). Estos autores argumentaban que la irrelevancia de la clave puede ser una de las razones por la que con algunas de ellas no se obtenga el efecto estudiado. Para poner a prueba esta hipótesis, en uno de sus

experimentos convirtieron la forma del objeto en una clave relevante pidiendo a los participantes contar el número de figuras (cuadrados o círculos) que se presentaban a través de los ensayos. En este caso, la forma, resultó ser efectiva como clave contextual y producir en este caso el esperado efecto de proporción de congruencia específico al contexto. Esta puede ser una de las explicaciones posibles en el caso de la tristeza al ser emparejada con la alegría.

Sería interesante realizar un tipo de prueba, como la que ingeniosamente idearon Crump y colaboradores para evaluar dicha posibilidad. Sin embargo, sería interesante indagar otras posibilidades. En cualquier caso, es interesante que mientras la dicotomía felicidad–ira conlleve por defecto la categorización de las caras en dos grupos, para que la dicotomía felicidad–tristeza induzca a la categorización se requiera inducir alguna estrategia de procesamiento. Es probable que la emoción de la tristeza sea una emoción más individual, que esté más asociada a procesos de individuación y a prestar atención al individuo más que a su grupo de pertenencia. Además, cabe la posibilidad de que diferencias individuales a la hora de formar impresiones sobre las caras tristes pueda producir este fallo en producir el efecto de proporción de congruencia específico al contexto y por tanto, sería interesante para futuras investigaciones, controlar el estado emocional del participante previa a la realización de la tarea.

Si partimos de una concepción amplia de lo que es un *estereotipo*, entendido como la asociación entre una serie de atributos y un grupo social, y salvando la distancia en la concepción de los estereotipos como atributo que es culturalmente compartido, los resultado extraídos de esta tesis, tienen una mayor relevancia, al brindar una nueva y original metodología para acercarse al estudio de la generación y aplicación de estereotipos de forma implícita.

Los resultados obtenidos de las series experimentales, nos permiten concluir, en la línea propuesta por los modelos de percepción de personas y un amplio abanico de investigaciones previas, que la categorización es dominante en la percepción de personas (e.g. Allport, 1954; Bodenhausen y Macrae, 1998; Brewer, 1988; Fiske y Neuberg, 1990; Hamilton, 1979; Hugenberg, Young, Bernstein y Sacco, 2010; Kawakami, Dion y Dovidio, 1998; Lippman, 1922).

Estos datos apoyan a su vez, los modelos clásicos de percepción social, en los que se hace hincapié en que en primer lugar las personas son procesadas utilizando la

categoría social a la que pertenecen (Brewer, 1988; Fiske y Neuberg, 1990 y Hugenberg y col. 2010) y solamente cuando los perceptores están motivados para percibir de forma más detallada a las personas percibidas, analizan y tienen en cuenta sus características idiosincrásicas.

Para concluir, nos gustaría resaltar una evidencia que puede ser fácilmente extraída de nuestros datos. El procesamiento en función del conocimiento previo que el perceptor tiene sobre el estímulo, no parece ocurrir de manera dual, como proponían algunos modelos de percepción social, sino que más bien, parece seguir un continuo (Fiske y Neuberg, 1990), dónde la cantidad de información necesaria para acceder al nivel del individuo parece depender de una gran cantidad de factores que necesitarán ser investigados en el futuro.

Somos conscientes, no obstante, de las limitaciones que las investigaciones aquí presentadas muestran y que deberían ser superadas en investigaciones futuras con la finalidad de enriquecer los resultados. Entre ellas se podría tener un control más riguroso del estado emocional del participante previo a la realización de la tarea, que puede ser de gran relevancia especialmente en la Serie experimental 2, ya que el estado emocional de las personas puede influir en su percepción de los demás (Forgas y East, 2008). Por otro lado, sería conveniente una selección más extrema de las caras de famosos de modo que sean más homogéneamente reconocidos/no reconocidos. Incluso sería deseable en este sentido utilizar caras familiares para cada participante (que serían no familiares para los otros participantes).

CONCLUSIONES

En las tres series experimentales que conforman esta tesis doctoral hemos desarrollado un procedimiento que nos permite evaluar la formación y aplicación de estereotipos de forma implícita, a través del la generalización del efecto de proporción de congruencia de estímulos consistentes con su categoría a aquellos inconsistentes y novedosos. La aplicación de control que conlleva la asociación a un porcentaje particular de congruencia parece estar dirigido de forma categórica y por tanto afectado por los aprendizajes implícitos extraídos del grupo y generalizados a todos los individuos. El participante aprende a comportarse de forma más o menos controlada con los miembros de un grupo en función de la proporción de congruencia que tenga asociada y aplica dichas estrategias a todos los miembros de la categoría.

Un dato a destacar de nuestra investigación reside en la modulación de dicho control cognitivo por características propias del perceptor, tales como su motivación y su conocimiento previo. Desde una perspectiva cognitiva, cuando el participante estaba muy motivado a individualizar, esta generalización no se producía, dato que puede ser interpretado como un efecto que parece ir más a favor de una hipótesis de proporción de congruencia específica del ítem, o una nueva posibilidad que presentamos, la capacidad del participante para diferenciar varios contextos individuales. Desde una perspectiva más social, este resultado apoya aquellos modelos de percepción social donde el perceptor juega un papel muy importante en los procesos de categorización-individualización (Fiske y Neuberg, 1990).

Además, mostramos la utilidad de las caras y las emociones como claves contextuales que pueden controlar nuestra atención de forma rápida y flexible. Así como la posibilidad de que las impresiones que el participante se forma a la hora de interpretar las emociones, parecen ser una clave subyacente a los efectos mostrados. Con todo, consideramos que el procedimiento desarrollado como metodología en esta tesis podría ser útil como herramienta en futuras investigaciones para investigar la formación y aplicación de estereotipos y procesos de categorización social e individualización.

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