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EMBODIMENT AND MOOD REGULATION : AN EXPERIMENTAL APPROACH TO THE ROLE OF THE BODY IN MOOD REGULATION PROCESSES.

COGNICIÓN CORPÓREA Y REGULACIÓN ANÍMICA : APROXIMACIÓN EXPERIMENTAL AL PAPEL DEL CUERPO EN LOS PROCESOS DE REGULACIÓN EMOCIONAL

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Embodiment and mood regulation. An experimental approach to the role of the body in mood regulation processes.

Cognición corpórea y regulación anímica. Una aproximación experimental al papel del cuerpo en los procesos de regulación emocional.

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Summary

Within the present work, we will introduce the concept of *embodied cognition*, an approach that considers the role of the body in cognitive processing. General findings of this approach and particularly those studies that could have intersections or implications for applied clinical psychology will be reviewed. We will also focus on models which either have included the body as a significant factor in their explanation of psychological disorders or have been directly inspired by the embodied cognition account. Moreover, we will introduce some psychological interventions that include the body as a significant part of the therapy. This empirical work includes three experiments aimed to examine the role of the body on mood regulation processes that will be described and discussed. Finally, we draw some conclusions and assess the implications which these experiments and, more generally, embodied cognition may have for clinical psychology.

The repercussion of embodied cognition on scientific research and the interest of authors of different fields on this topic have increased exponentially in the last ten years, especially in cognitive neuroscience, social neuroscience, cognitive psychology, social psychology, and developmental psychology, but also in robotics, cognitive ecology, psycholinguistics and cognitive linguistics (Barsalou, 2010). The embodied cognition account has revealed the enthusiasm of some researchers, up to a point that some authors have proposed that embodiment may be the appropriate framework for unifying psychological science (Schubert & Semin, 2009), as well as the skepticism of some others (e.g., Adams, 2011).

In our opinion, embodiment may actually enrich the knowledge we have about psychological processes. Concepts, ideas and experimental results of embodiment have had an impact on modern psychology. One of the most important outcomes derived

from embodiment is that more researchers have directed their attention to the influence of bodily states on abstract cognitive and emotional processes. The role of the body has been restituted, and the importance and influence of sensorimotor processes and bodily states in cognition and emotion is increasingly attracting research. Some previously mentioned results can have potential implications, both theoretical and applied, but indeed, more research focusing on the influence of bodily states in mental processes involved in or partially responsible for psychological disorders is needed. We believe that there is a lack of studies addressing this question, and therefore revealing influences of bodily states in psychological processes related to mental disorders can be of interest for both experimental and clinical psychologist. For the former, this could form an interesting and highly unexplored field of research, for the later, this could increase the motivation of these psychologists to include the body in therapy, and to develop bottom-to-top intervention strategies complementary to the most employed top-to-bottom, which could eventually improve the outcomes of psychotherapy. Moreover, it could help to bridge both disciplines, making results from experimental psychology more directly applicable for clinicians. Although it may be theoretically plausible to propose that bodily states can influence the course of a certain disorder, evidence of this influence on psychological processes crucial for the disorder is essential in maintaining this hypothesis. Therefore, the aim of the present study is to test whether some of the motor processes that are reported in the revised literature as influencing cognitive or affective processes, may have an influence on psychological processes considered to be involved in the maintenance of disorders.

For the aim of the present study we considered that mood regulation was a suitable target process, as it is a perfect intersection between the ultimate function of emotions (Koole, 2009) and a diversity of implicit and explicit operational modes

(Gyurak, Gross, & Etkin, 2011). Thus, in the next sections of the present work, general information concerning mood regulation will be provided. In addition, three experiments, conducted to experimentally explore the influence of bodily states on mood regulation, will be reported.

As we have seen within the present work, the embodiment account could have important theoretical and practical implications in the field of clinical psychology. On the one hand, considering the role of bodily states on mental processes could help psychologists to have a more holistic view of individuals' cognitive and emotional functioning, as stated by Damasio (1994, p.118) "*the separation between mind and body is probably just fictional. The mind is embodied, in the full sense of the term*". The Lindeman and Abramson (2008) model suggests that simulation of motor incapacity could be responsible for motor symptoms of depression. This model has directly emerged from some theoretical principles of the embodiment account, and represents an example of how embodiment could help to enrich the way we understand psychological disorders. Although Lindeman and Abramson's model only refers to symptoms of motor incapacity, providing theoretical basement in support of their hypotheses, it does not constrain the possible influence of bodily states on motor symptoms of depression. In fact, the results obtained in the present work suggest that the influence of bodily states goes beyond symptoms of motor incapacity. At least in subclinical samples, vertical head movements in combination with positive images seem to improve the mood regulation ability of dysphoric individuals. Bodily states could interact with internal and external information influencing other emotional processes related to depression (e.g., emotional processing of bereavement). Thus, the simulation of motor incapacity could account for the motor symptoms of depression, but the contribution of

bodily states to other higher order processes involved in depression is still rather unexplored.

The embodiment account reflects the idea that multimodal information is reenacted producing higher order cognitive and emotional processes. This is a notion in line with the cognitive and emotional functioning proposed by multi-level models of emotion (Philippot, Baeyens, Douilliez, & Francart, 2004; Power & Dalgleish, 1997; 2008; Teasdale & Barnard, 1993). Despite their interest, these models have generated a small amount of research, probably due to their complexity. Studies based on paradigms with an origin on the embodiment approach, such as those included in this work, could help to add more evidence in support of the notions proposed by multi-level models of emotion.

It is important to note that some of these paradigms have been successfully employed to modify bias towards alcohol (Wiers et al., 2011) and that the combination of cognitive bias modification based on approach and avoidance movements with CB interventions improved the percentage of relapse in alcoholic patients. This is an initial step that signals how the embodiment approach can help to enrich interventions by including the body in therapeutic practice. Future research may also address the question whether bodily states that are associated with approach or avoidance could be manipulated in order to improve treatments in which exposure is the main component. Moreover, these results may also encourage us to devote more efforts to the study of the efficacy of psychological interventions that include somatic elements as central in psychological therapy.

In our view, the most important contribution of the embodiment approach is the restitution of the role of the body in psychological processes. The body is not only the primary tool that individuals have to interact with the environment, but also a source of

information and the substrate in which abstract cognitive and emotional processes have their origin. Taking into account the tight link existing between bodily states and emotion and also the suggested link between bodily states and cognitive processes, it seems that incorporating the body into clinical practice may open a bottom-up way of intervening in dysfunctional psychological processes, complementary to the more frequent top-bottom interventions, emanating from traditional cognitive approaches. The inclusion of the somatic path as a research topic common to all psychological approaches might become one of the main challenges of psychology over the next decades.

Resumen

La llamada revolución cognitiva (e.g., Chomsky, 1964) sacudió los cimientos de lo que hasta entonces era considerado el modelo psicológico dominante, el de la psicología conductual (e.g., Skinner, 1956). Al contrario que la psicología conductual, más enfocada en el principio de acción-reacción y en los modelos de estímulo-respuesta, la psicología cognitiva concedía un importante papel a todos los procesos que sucedían internamente en un individuo y que en multitud de ocasiones condicionaban las respuestas que se daban a los estímulos. El creciente desarrollo de la informática y la expansión tecnológica permitió a los teóricos de entonces equiparar el funcionamiento del sistema cognitivo humano con el de un ordenador. La metáfora del ordenador permitía resaltar la importancia de los procesos cognitivos (el software) frente a lo que había sido el objeto de estudio hasta entonces, el input (estímulo) y el output (respuesta). El código binario, lenguaje primario de estos aparatos, consistente en señales amodales de activación/ no-activación, alentó la equiparación del funcionamiento del cerebro, donde las neuronas se comunican entre ellas mediante impulsos eléctricos (e intercambios bioquímicos), con el del ordenador. Así, se estableció que los procesos como el pensamiento, la imaginación o la percepción de las distintas sensaciones debían pasar por un proceso de transformación a códigos amodales que serían interpretados por un "ejecutivo central" ubicado en el cerebro. Conceptos y procesos como los pensamientos, los estilos atribucionales, los sesgos atencionales y de memoria, la preocupación o la rumiación, que durante la vigencia del modelo conductual tradicional no habían atraído el interés de los investigadores, por el hecho de no ser observables y difícilmente cuantificables, cobraron especial relevancia en esta nueva etapa de la psicología. La metáfora del ordenador ofrecía multitud de posibilidades y había mucho campo que explorar en torno a la gama de procesos

cognitivos de los que el ser humano es capaz. A la vez que cobraban importancia en la investigación, los procesos cognitivos y los conceptos de la psicología cognitiva se fueron paulatinamente incorporando a los modelos psicopatológicos y de intervención clínica (e.g., Beck, 1976). En una suerte de efecto rebote, debido seguramente a la falta de atención que estos procesos habían recibido durante años, los nuevos modelos cognitivos enfatizaban el papel de los esquemas, las creencias, los pensamientos distorsionados, o los estilos atribucionales en el desarrollo y mantenimiento de los distintos trastornos. El nuevo enfoque cognitivo amplió el espectro de procesos que serían a partir de entonces objeto de estudio de la psicología, y ha contribuido al desarrollo de modelos psicológicos y psicopatológicos más complejos, que integran cada vez más elementos intervinientes y que, por lo tanto, reflejan con mayor precisión la complejidad de la psicología humana (e.g., Vázquez, Hervás y Romero, 2010). Sin embargo, los modelos cognitivos no están exentos de críticas que señalan algunas de sus flaquezas, como el exceso de "cognitivización", el difícil encaje de elementos emocionales y motivacionales en algunos de sus modelos, o la falta de atención a otros procesos más elementales, como los procesos corporales, a los que se relega a un papel cuasimarginal en la mayoría de estos modelos. Haciendo una analogía algo metafórica, podríamos comparar la psicología cognitiva con los homúnculos sensorial y motor descubiertos por el neurofisiólogo estadounidense Wilder Penfield (1891 - 1976) en el córtex cerebral. Al igual que los homúnculos no son fieles representaciones del cuerpo humano ya que, atendiendo únicamente a su representación neural, zonas del cuerpo como las manos o los labios tendrían un tamaño exageradamente más grande del que en realidad tienen, mientras que otras zonas como la espalda o los muslos disminuirían, del mismo modo, en la imagen que tendríamos de la psicología humana a partir del cuadro dibujado por la psicología cognitiva, los procesos cognitivos, en especial los procesos

superiores conscientes y los relacionados con el lenguaje, a los que se ha dedicado mucha atención, estarían sobrerrepresentados, mientras que otros que no han recibido tanto interés por parte de los investigadores estarían infrarrepresentados. Haciendo esta vez una analogía con la medicina tradicional china (MTCH), mientras el común de los occidentales sabemos tomarnos el pulso con dos dedos en la muñeca o en el cuello, los expertos en MTCH distinguen un mínimo de 19 tipos de pulsos, en una suerte de sensibilidad táctil desarrollada a lo largo de milenios de aplicación. Del mismo modo, la ciencia psicológica se ha hiperespecializado en los procesos cognitivos, acuñando conceptos parcialmente superpuestos que difieren en pequeños matices como por ejemplo rumiación, con sus variantes de *brooding* o *reflection*, obsesión o preocupación, que la mayoría de los legos podrían identificar como procesos de pensamiento con un componente emocional negativo, pero que un psicólogo cognitivo experto podría escribir un libro hablando de las diferencias entre uno y otro, aunque tuviera que admitir que existe un cierto solapamiento entre ellos.

En definitiva, como ya sucedió anteriormente con los procesos emocionales y motivacionales, que gracias al esfuerzo de numerosos investigadores han ido cobrando importancia y relevancia dentro del modelo vigente, en los últimos 20 años la corriente del *embodiment* o la *embodied cognition*, (un término acuñado por Valera, Thompson y Rosch en 1991 y que ha sido traducido a veces como “cognición encarnada” otras veces como “cognición incorporada” y algunas también como “cognición corpórea”, de las cuáles ninguna parece tan precisa como el original inglés, que por tanto se seguirá empleando), ha revitalizado el interés de los estudiosos por el papel del cuerpo en los procesos mentales superiores. La postura de Varela y sus colaboradores rechaza las ideas de las teorías cognitivas más tradicionales que conceptualizan el conocimiento como un logro abstracto y meramente intelectual, que tiene lugar gracias a procesos

análogos a la computación pasiva y que relega a un papel secundario a las acciones que los individuos ejecutan en el proceso de formación de sus experiencias. En su lugar, estos autores proponen un modelo de continuidad entre la vida y la mente en el que se resalta el papel de la acción, el cuerpo, o las habilidades sensoriomotrices para explicar la actividad cognitiva. Desde entonces, se han incrementado sustancialmente las investigaciones sobre *embodiment*, no sólo en el ámbito de la psicología y ciencia cognitiva (e.g., Barsalou, 1999; 2008) sino en otros ámbitos como la robótica (e.g., Brooks, 1991) la psicología social (e.g., Meier, Schnall, Schwarz, y Bargh, 2012), la psicolingüística (e.g., Glenberg y Kaschak, 2001) o las neurociencias (e.g., Damasio, 1994), al mismo tiempo que su influencia ha ido calando en estas disciplinas. La corriente del *embodiment* contrapone la filosofía de Heidegger a la tradicional mecanicista cartesiana. Si para Descartes la cognición, como cualquier otro fenómeno observable, es el resultado de una relación estática y predeterminada de una serie de elementos atómicos e irreductibles componentes de un fenómeno, para Heidegger la actividad cognitiva se arraiga en aquella disposición que es constante, que no es otra que el propio cuerpo, para responder en cada instante a las demandas de un mundo exterior en constante cambio que además es experimentado como un todo significativo e indivisible, que no puede ser reducido a elementos más básicos. El cuerpo, con sus acciones y sus habilidades sensoriomotrices se convierte en el soporte de la cognición. Esta idea se ve plasmada perfectamente en el trabajo de Barsalou (2008), ya que este autor propone que la cognición no consiste en la computación de símbolos amodales, sino en la reactivación de las representaciones modales que son componentes de la experiencia. Estos elementos modales no son otros que las sensaciones y las percepciones que un objeto y la interacción con el mismo, producen en nuestro cuerpo y también en nuestras redes neurales.

Como decía, los trabajos de estos autores, entre otros, han inspirado una cascada de estudios dirigidos a comprobar este enraizamiento de la cognición en el cuerpo o, una vez que el cuerpo se redefine como un elemento constituyente de los procesos cognitivos, muchos investigadores han tratado de dilucidar el papel que juegan las sensaciones, movimientos y gestos corporales en la cognición. Sin embargo, la exploración de la literatura disponible que se llevó a cabo al comienzo de este trabajo, reveló que el ámbito de la psicología clínica era uno de los que, dentro de la psicología, menos se había visto influido por esta corriente de pensamiento. Se podían hallar pocos estudios encaminados a dilucidar la influencia del cuerpo en procesos cognitivos relacionados con el desarrollo y mantenimiento de trastornos psicológicos. De manera que, por una parte, existía una corriente teórica que estaba reivindicando el papel del cuerpo en la cognición y por otra, existían algunas propuestas de intervención que se vienen aplicando en el tratamiento de diversos trastornos psicológicos, en especial en países germánicos, pero también, aunque en menor medida, en culturas anglosajonas e hispanohablantes; si bien es cierto que, en general, cuentan con poca evidencia científica (en algunos casos, ninguna) que las avale. Este trabajo es un intento de tender puentes entre dos disciplinas, la básica y la clínica, que en algunos casos discurren paralelamente, como por las dos orillas de un río, sin a veces apercibirse de la presencia de la otra. He llevado a cabo este trabajo en la creencia de que tan de utilidad puede ser para un clínico el tener conocimiento de la teoría y resultados que avalan la corriente teórica del *embodiment*, porque puede enriquecer tanto la manera en la que se conceptualizan los trastornos como los mecanismos que se utilizan en la intervención; como para un investigador básico saber de qué manera se viene utilizando el cuerpo en la terapia psicológica, y en la convicción de que es necesario reivindicar el papel del

cuerpo dentro de la psicología y explorar las posibilidades que ofrece como contrapunto al diálogo y a la conversación en psicoterapia.

El trabajo está dividido en cuatro estudios, el primero de ellos consistente en una revisión teórica del estado de la cuestión en el *embodiment*, con especial hincapié en aquellos resultados que pueden ser más relevantes desde el punto de vista de un psicólogo clínico, además de revisar aquellos modelos psicológicos que otorgan un papel al cuerpo y un repaso de las intervenciones más relevantes y con mayor respaldo científico que utilizan el cuerpo como uno de los ejes fundamentales de la intervención. Los tres siguientes son estudios experimentales que tratan de explorar inicialmente el papel que juega el cuerpo en procesos psicológicos muy relacionados con la psicopatología. En concreto, se describen una serie de tres experimentos en los que el objetivo era explorar si la ejecución de distintos movimientos corporales, asociados en la literatura con aproximación o rechazo (i.e., asentir o denegar con la cabeza, extender o encoger el brazo) podían jugar un papel en la regulación emocional de participantes a los que previamente se había inducido un estado de ánimo triste. A continuación, el lector podrá encontrar el resumen en castellano de cada uno de los cuatro estudios. Al final de los cuatro resúmenes se ha incluido un epígrafe con la discusión general de los estudios y las principales aportaciones que considero que este trabajo realiza a la disciplina.

Estudio 1

En este primer estudio, el objetivo general es acercar al lector al estado del arte en el *embodiment*, resumiendo los resultados fundamentales que sostienen la aproximación teórica y muy en especial aquellos que pudieran resultar de interés desde

una perspectiva clínica. Además, se introducirán tanto modelos teóricos con aspectos comunes con la teoría del *embodiment*, como intervenciones clínicas en las que el cuerpo juega un papel destacado.

Una de las aportaciones del *embodiment* es la idea de que la cognición se basa en representaciones de las distintas modalidades sensoriales (e.g., visual, auditiva, táctil, cenestésica) y no en la computación de símbolos amodales. Un ejemplo puede ayudar a ilustrar esta idea. En cualquier situación (p.ej., estar tumbado en la cama) el cerebro recibe información multimodal (i.e., perceptiva, proprioceptiva, motora) y la integra como una representación global en la memoria (i.e., el aspecto de la cama, la sensación en la espalda, los movimientos necesarios para tumbarse). Posteriormente, cuando se quiere acceder al contenido "cama" en la memoria, estas representaciones modales se reactivan *simulando* la activación cerebral ocurrida durante la experiencia anterior. Según esta aproximación, los estados corporales son constituyentes de la cognición y, por lo tanto, estados corporales pueden desencadenar estados cognitivos y viceversa (Barsalou, Niedenthal, Barbey, y Ruppert, 2003; Smith, 2005). Esta idea se ve refrendada por varios estudios neurocientíficos que han hallado las denominadas *neuronas espejo* (Rizzolatti, Fadiga, Gallese, y Fogassi, 1996), un mecanismo neural común en simios e humanos que reveló que las mismas neuronas implicadas en la ejecución de una acción se activaban también cuando se percibía la misma acción realizada por otro individuo. Estos circuitos de neuronas duales, activas tanto en la acción como en la representación de la misma, sirven como base al concepto de simulación. La simulación es la reactivación en ausencia de acción u objeto de los circuitos neurales activos durante la acción o la interacción con el objeto. Autores como Damasio (1994), Barsalou (1999) o Gallese (2010) comparten la idea de que la simulación es la base de los procesos mentales superiores. Gallese además sostiene que

la comprensión interpersonal se basa en la simulación, que es la mayor fuente de conocimiento de los demás. Por su parte, Gallese y Lakoff (2005) afirman que las simulaciones sensoriomotrices, muchas veces de forma metafórica están involucradas en la elaboración y comprensión de conceptos abstractos. Con matices según los distintos autores, una idea común es que los componentes sensoriomotrices de la experiencia forman parte de los procesos mentales superiores. Son muchos los estudios que han encontrado evidencia en favor de esta idea. A continuación haremos referencia a los más importantes desde el punto de vista del *embodiment*, con especial hincapié en los estudios que pudieran ser más relevantes desde la perspectiva de un clínico.

Estudios empíricos relevantes para el *embodiment*

En la última década, el número de estudios relacionados con el *embodiment* ha aumentado considerablemente. Hemos tratado de organizarlos en secciones en función de la parte del cuerpo involucrada en el estudio y dentro de cada sección, hemos tratado de ir de lo más general a lo particularmente interesante para la psicología clínica. Sin tratar de ser una revisión exhaustiva, sí se ha intentado al menos incluir los estudios de revisión o, en su caso, meta-análisis existentes.

El interés en la relación entre el cuerpo y los procesos mentales superiores se remonta a los inicios de la ciencia moderna. Charles Darwin (1872) definió la actitud como el conjunto de conductas motoras que reflejan la evaluación que un organismo hace de un objeto. Por su parte, William James defendía la idea de que las emociones son desencadenadas por cambios corporales. Según James (1884,1890) los cambios corporales siguen directamente a la percepción del hecho excitador, y la emoción es la forma de sentir esos cambios cuando tienen lugar. Los estudios de Guillaume Duchenne

(1862) combinaban la estimulación eléctrica con las incipientes técnicas fotográficas para mostrar que la contracción de ciertos músculos faciales determinaba las expresiones emocionales. Más recientemente, Robert Zajonc (1980) reflexionaba sobre la naturaleza no cognitiva del afecto y las preferencias. Zajonc hizo hincapié en la estrecha relación entre el sistema motor y el afecto, sosteniendo que el afecto no siempre se transforma en contenidos semánticos, sino que muchas veces es codificado en patrones viscerales o motores. En un estudio experimental, Zajonc y Marcus (1982) volvían a sugerir que las expresiones motrices de la respuesta afectiva (visceral, fisiológica y facial) podrían influir los procesos evaluativos de los individuos.

Gestos faciales y emociones.

La mímica y la expresión facial es probablemente uno de los temas que más atención ha recibido por parte de los investigadores interesados en las influencias corporales en procesos mentales superiores. La universalidad de las expresiones faciales emocionales y la habilidad humana de reconocer los estados internos de otras personas a partir de su expresión facial, convirtió la investigación sobre gestos faciales en una de las principales vías de estudio de la relación entre los procesos sensoriomotrices y otros procesos cognitivos y emocionales. Se puede encontrar una revisión de los estudios clásicos sobre gestos faciales en la revisión de Adelmann y Zajonc (1989).

La investigación en este terreno propició una controversia entre los autores que proponían un mecanismo cognitivo de auto-monitorización subyacente a la influencia del feedback facial en la experiencia emocional y aquellos autores que sostenían que la mediación cognitiva no era necesaria para que se diese esa influencia y que la activación de los mecanismos fisiológicos involucrados en gestos como las expresiones faciales

serían suficientes para provocar reacciones afectivas. En el estudio de Strack, Martin y Stepper (1988) se trataba de resolver esta polémica. Para ello, los autores manipularon de forma encubierta la expresión facial de los participantes, de manera que se evitaba la interpretación cognitiva del gesto facial, evaluando posteriormente cómo el mantener distintos gestos afectaba al juicio de los participantes. En concreto, los autores solicitaron a los participantes que leyeran una serie de tiras cómicas mientras mantenían un lápiz sujeto sólo con sus labios (para lo cual tenían que mantener un gesto incompatible con la expresión de la sonrisa) o sólo con sus dientes (para lo cual tenían que mantener un gesto que se asemejaba a una sonrisa). Conforme a las hipótesis de los autores, los participantes que sostuvieron el lápiz con los dientes evaluaron las tiras como más divertidas que los que lo sostuvieron con sus labios, demostrando que la evaluación cognitiva no era necesaria y que la activación fisiológica de ciertos músculos puede tener una influencia en las evaluaciones.

Estudios posteriores confirmaron y ampliaron estos resultados (p.ej., Larsen, Kasimatis, y Frey, 1992; Soussignan, 2002). Usando una metodología similar, Havas, Glenberg y Rink (2007) encontraron que los participantes de su estudio tenían mayor facilidad para comprender el contenido de una frase cuando el contenido afectivo de la misma era congruente con la expresión facial del participante. Por su parte, Duclos y sus colaboradores (1989) observaron que la manipulación de los músculos faciales involucrados en las expresiones de tristeza, miedo, asco o ira, conducía a los participantes a un incremento subjetivo de la emoción expresada (en comparación con otras). En otro estudio, Niedenthal, Winkielman, Mondillon, y Vermeulen (2009) hallaron que, lejos de ser un efecto colateral de presenciar información emocional, la mímica facial ejercía un papel causal en el procesamiento de conceptos emocionales. Cuando se inhibía la activación de ciertos músculos faciales, los participantes

mostraban menor precisión a la hora de relacionar conceptos con emociones que involucrasen la actividad de esos músculos. De igual modo, Oberman, Winkielman y Ramachandran (2007) encontraron que impedir la activación de algunos músculos faciales dificultaba el reconocimiento de emociones en cuya expresión se vieran implicados, Duclos y Laird (2001) hallaron que la supresión de las expresiones emocionales afectó a la intensidad emocional de sus participantes, y, complementariamente, Niedenthal, Brauer, Halberstadt, e Innes-Ker (2004) encontraron que la habilidad de detectar cambios en caras emocionales de los participantes de su estudio se veía afectada por sus estados emocionales internos.

Desde un punto de vista clínico, el estudio de Teasdale y Bancroft (1977) es de particular relevancia. En este estudio, los autores emplearon un electromiograma (EMG) para comparar, en una pequeña muestra de participantes deprimidos, la actividad del músculo corrugador mientras los participantes mantenían pensamientos felices o infelices. Los pensamiento infelices produjeron un incremento tanto en la actividad del corrugador como en los síntomas de depresión, y lo que aún es más importante, se halló una elevada correlación entre la actividad del músculo corrugador y el estado de ánimo deprimido. Otro estudio importante desde una perspectiva clínica lo llevaron a cabo recientemente Kraft y Pressman (2012). En este estudio, se dividió a los participantes en tres grupos. Se instruyó a los participantes para que sujetaran con la boca unos palillos chinos de forma que la expresión facial resultaba neutra en el primer grupo, una sonrisa estándar en el segundo y una sonrisa de Duchenne en el tercero. Los autores encontraron que mantener una expresión análoga a la sonrisa afectaba al estado físico de los participantes. En concreto, después de pasar por una tarea estresante, los sujetos de los grupos de sonrisa estándar o sonrisa Duchenne manifestaron un descenso menor del afecto positivo que los sujetos del grupo que mantuvo una expresión facial neutra.

También algunos procesos perceptuales y de memoria parecen verse influidos por la activación de los músculos faciales. En un estudio reciente, Susskind, Lee, Cusi, Feiman, Grabski y Anderson (2008) hallaron que adoptar una expresión de miedo o asco afectaba a la capacidad sensorial de los participantes de su estudio. En concreto, se instruyó a los participantes para que adoptaran una expresión de miedo, de asco o una expresión neutral durante el estudio. Mientras mantenían una expresión de miedo, los participantes incrementaron su capacidad de inspiración nasal, aceleraron sus movimientos sacádicos e incrementaron su campo visual, mientras que al adoptar una expresión de asco disminuyeron todos estos parámetros con respecto a los obtenidos cuando los sujetos mantuvieron una expresión facial neutral. Los autores concluyeron que las expresiones faciales no sólo son señales de las emociones correspondientes, sino que pueden alterar la predisposición del individuo para la percepción y la acción. Siguiendo con procesos de memoria, Riskind (1983) encontró que sonreír facilitaba el acceso a recuerdos autobiográficos positivos. Más recientemente, Topolinski (2012) encontró que la inhibición del componente motor en el procesamiento de palabras afectaba a la familiaridad y a la memoria implícita, pero no al recuerdo de las palabras presentadas. En este estudio, el autor encontró que al ejecutar tareas motoras que interfirieran con la simulación motora de las palabras (i.e., masticar chicle) influía sistemáticamente en la familiaridad y la memoria implícita (medida mediante la preferencia que los individuos muestran por estímulos previamente presentados), mientras que las medidas de recuerdo explícito no se vieron alteradas. El hallazgo de este inusual efecto, ya que es mucho más frecuente hallar el efecto contrario, es decir que sea la memoria explícita la más afectada, hace que este estudio pueda ser especialmente relevante, ya que un patrón similar solo se ha encontrado con anterioridad en algunos individuos con lesiones cerebrales o en trastornos disociativos

como el síndrome de Capgras. Este resultado sugiere que las sensaciones motrices pueden jugar un papel en la memoria implícita.

En resumen, los gestos faciales pueden modular la experiencia emocional, facilitar la aparición de estados de ánimo y recuerdos congruentes además de que parecen tener una influencia sobre procesos perceptuales y de memoria.

Movimientos del brazo

Uno de los primeros estudios que revelaron influencias corporales en procesos cognitivos fue llevado a cabo por Cacioppo, Priester y Bernston (1993). En este estudio, los participantes visionaron ideogramas chinos aleatoriamente seleccionados mientras ejecutaban un movimiento de aproximación o rechazo con los brazos. Los autores encontraron que los ideogramas que habían sido visionados mientras se realizaban movimientos de aproximación (i.e., tirar de algo hacia sí) eran evaluados como más positivos que los que se visionaron mientras se realizaba un movimiento de evitación (i.e., empujar algo). En un estudio complementario al anterior Chen y Bargh (1999) encontraron que los participantes reaccionaban más rápidamente cuando tenían que responder a palabras negativas con un movimiento de extensión y a palabras positivas con un movimiento de flexión, que cuando la asociación entre palabras y movimientos de respuesta era la inversa. Estos resultados han sido corroborados y extendidos en varios estudios posteriores, que en general apuntan a que los movimientos del brazo pueden afectar a la evaluación y viceversa (para un resumen de resultados ver por ejemplo Phing, Dhillon, & Beilock, 2009). Phing y colaboradores (2009) sugieren que la dificultad del movimiento afecta a las preferencias de los individuos. En su estudio, encontraron que, entre dos objetos idénticos colocados en distintas posiciones, los

participantes elegían más frecuentemente el más fácil de alcanzar cuando se les preguntaba por el objeto que más les gustaba, pero no cuando se les preguntaba por el que más les disgustaba. Los autores concluyeron que las preferencias que establecemos en nuestro día a día están íntimamente ligadas al sistema motor y que tanto las preferencias como la percepción se cimentan en las acciones.

En el ámbito de la psicolingüística también se ha encontrado evidencia que sugiere una influencia de los movimientos del brazo, en este caso en el procesamiento del lenguaje. Glenberg y Kaschak (2002) llevaron a cabo un estudio en el que sus participantes tenían que decidir si unas frases tenían sentido o no presionando uno de dos botones que estaban colocados cerca y lejos del cuerpo, respectivamente. Las frases incluían verbos que indicaban acciones o movimientos dirigidos hacia el individuo (p.ej. recibir) o desde el individuo hacia fuera (p.ej. dar). Los autores hallaron que las respuestas eran más rápidas cuando el movimiento que había que realizar para apretar el botón de respuesta era congruente con la direccionalidad del verbo y denominaron a este fenómeno con el nombre de "efecto de compatibilidad entre frase y acción" (ACE, por sus siglas en inglés). Un efecto que parece ser robusto, ya que ha sido corroborado y ampliado en otros studios (p.ej., Taylor y Zwaan, 2008; Zwaan & Taylor, 2006).

De especial relevancia desde el punto de vista de la psicología clínica, es el estudio de Wiers, Eberl, Rinck, Becker y Lindenmeyer (2011). En este estudio, llevado a cabo con pacientes alcohólicos los investigadores utilizaron una tarea de modificación de sesgos hacia el alcohol que consistía en realizar movimientos de extensión del brazo en respuesta a imágenes de bebidas alcohólicas y movimientos de flexión del brazo en respuesta a imágenes de bebidas no alcohólicas. En comparación con los controles, se observó que los sujetos que fueron asignados a la condición experimental habían revertido su sesgo inicial favorable al alcohol, convirtiéndose en un sesgo de ligera

aversión. Más importante aún, tras pasar por un tratamiento psicológico cognitivo-conductual, y después de un año de seguimiento, los investigadores comprobaron que la tasa de recaída entre los pacientes del grupo experimental era significativamente menor (46%) que la del grupo control (59%). Estos resultados sugieren cómo una intervención involucrando elementos motores relacionados con aproximación y rechazo puede ayudar a mejorar los resultados de las terapias.

Movimientos de la cabeza.

Uno de los primeros estudios en este campo lo llevaron a cabo Wells y Petty (1980). En ese trabajo, los autores estudiaron si realizar movimientos de cabeza tenía influencia en la actitud del individuo hacia la información que se le presentaba. En concreto, los autores pidieron a los participantes que hicieran movimientos verticales o laterales de cabeza mientras escuchaban un programa de radio. Independientemente de la ideología de los participantes y del contenido del programa, los autores observaron que los participantes que asintieron mostraron un mayor acuerdo con el contenido que los que denegaron con la cabeza.

Por su parte, Briñol y Petty (2003) llevaron a cabo un estudio para estudiar la influencia de los movimientos de cabeza en la persuasión. Estos autores observaron que la fuerza de los argumentos interactuaba con los movimientos de cabeza, de manera que cuando se le presentaba a los sujetos argumentos de peso, asentir con la cabeza facilitaba la persuasión, mientras que denegar la dificultaba. Por el contrario, cuando los argumentos no eran sólidos, el efecto del movimiento de cabeza era el opuesto. Los autores concluyeron que los movimientos de cabeza afectaban a la confianza que el individuo tiene en sus propios pensamientos.

El estudio de Tom, Peterson, Lau, Burton y Cook (1991) se centró en la influencia de los movimientos de cabeza en las preferencias. Los autores enmascararon el estudio como si fuera una prueba de la comodidad de unos nuevos auriculares para utilizar durante la práctica de ejercicio físico. A una parte de los participantes se le pidió que se pusieran los cascos y moviesen la cabeza de arriba abajo, como sucedería si estuviesen corriendo. A la otra mitad se les pidió que moviesen la cabeza lateralmente, como si montaran en bicicleta. Durante el experimento, los participantes estuvieron expuestos a un bolígrafo que luego serviría para comprobar su preferencia. Al final del ejercicio, los autores les informaron de que la marca estaba pensando en realizar una campaña promocional, parte de la cual era regalar un bolígrafo. Pidieron a los participantes que decidiesen qué bolígrafo preferirían ellos recibir, y les dieron a elegir entre el bolígrafo que habían estado viendo y uno nuevo que no habían visto. Dos tercios de los participantes que movieron verticalmente la cabeza eligieron el bolígrafo que habían visto. La misma proporción de los que habían movido lateralmente la cabeza eligieron el nuevo.

Por último, Forster y Strack (1996) estudiaron la influencia de los movimientos de cabeza en la memoria. En una serie de tres experimentos, estos autores encontraron que asentir con la cabeza, en comparación con realizar movimientos de denegación, facilitaba el recuerdo de memorias positivas.

Posturas corporales y locomoción.

Numerosos estudios sobre *embodiment postural*, siguiendo la terminología de Niedenthal y cols. (2005), han encontrado relaciones entre los movimientos corporales y los procesos cognitivos y emocionales. Uno de los primeros estudios en este ámbito lo

llevaron a cabo Riskind y Gotay (1982). Encontraron que la postura afectaba tanto a los autoinformes del estado de ánimo que los participantes estaban completando, como a la ejecución de una tarea. Los participantes que mantenían una postura encorvada (slumped) refirieron peor estado de ánimo y eran más proclives a abandonar una tarea cuando estaban teniendo éxito. Por el contrario, los participantes que mantuvieron una postura erguida mostraron un estado de ánimo más positivo y se mostraron más proclives a abandonar una tarea en la que no estaban teniendo éxito. Cuando la postura era congruente con el resultado, los participantes permanecían haciéndola durante más tiempo.

En el segundo experimento de su estudio, Duclos y cols. (1989) comprobaron la influencia de la postura en los autorregistros emocionales. En su experimento, se instruyó a los participantes para que mantuvieran posturas de miedo, ira o tristeza. Posteriormente, se les preguntó en qué medida habían sentido ocho posibles emociones. Los resultados mostraron que al adoptar cada postura, los participantes incrementaron la emoción expresada con respecto a las demás. Estos resultados fueron corroborados y extendidos en el estudio de Flack, Laird y Cavallaro (1999). Estos autores pidieron a sus participantes que adoptaran gestos faciales, posturas corporales, o ambas simultáneamente, que evocaban ira, tristeza, miedo o alegría. Encontraron que tanto las posturas como los gestos relativos a una emoción potenciaban su presencia en los participantes, y que los efectos provocados por posturas y gestos eran aditivos. Complementariamente, otros estudios han encontrado que mantener posturas incompatibles con una emoción reducen la respuesta neural asociada (p.ej., Harmon Jones y Peterson, 2009). La influencia de los estados corporales en las emociones parece ser mayor en aquellas personas que son más sensibles a claves personales que a

situacionales (Duclos y Laird, 2001; Herbert, Herbert, y Pollatos, 2011; Herbert y Pollatos, 2012).

Volviendo a los aspectos más clínicos, Ramseyer y Tschacher (2011) estudiaron la influencia de la coordinación de movimientos entre terapeuta y paciente en los resultados de la terapia. Encontraron una sincronía de movimientos entre paciente y terapeuta por encima del nivel de azar. Además, el tipo de sincronía estaba relacionado con aspectos interpersonales de la terapia. Cuando el terapeuta se sincronizaba con los movimientos del paciente, se incrementaba el nivel de autoeficacia percibida por parte del paciente. En cambio, cuando era el paciente el que se sincronizaba al terapeuta, mejoraba la relación terapéutica a los ojos del paciente. Estos resultados indican que tanto la relación psicológica como los estados internos de dos personas que interactúan se reflejan en sus cuerpos, que juegan un papel importante en el mantenimiento de las relaciones.

Complementariamente, el estudio de Butler y cols. (2003) examinó las consecuencias personales y sociales de suprimir la expresión emocional durante una cconversación. En la condición de supresión emocional se instruyó a uno de los participantes (i.e., el regulador) para que no expresara sus emociones, mientras que en la condición de control no se le dio instrucciones a los participantes. En comparación con la condición de control, la supresión emocional produjo un incremento en la presión arterial de ambos interlocutores, incrementó el nivel de distracción del regulador durante la conversación y disminuyó en el otro interlocutor el sentimiento de rapport y la voluntad de desarrollar una amistad posteriormente.

También hay estudios sobre la forma de andar que contribuyen a la idea de que los estados corporales influyen en procesos superiores. Por ejemplo, el estudio de Michalak, Troje, Fischer, Vollmar, y Schulte (2009) encontró que la manera de andar de

individuos deprimidos o a los que se había inducido un estado de ánimo triste difería de la del grupo control, y además estas diferencias se ven atenuadas con la terapia (Michalak, Troje, y Heidenreich, 2010). Recíprocamente, inducir una manera de andar afecta, por ejemplo, a procesos de memoria. En un estudio de Rohde, Troje, y Michalak, (2012) se halló que los participantes a los que se indujo a mantener una forma de andar "triste" mostraron un sesgo más negativo en una tarea de memoria autorreferente.

En resumen, los estudios sobre embodiment postural han encontrado que la postura corporal puede afectar estados emocionales, así como también a procesos motivacionales, perceptuales y de memoria.

Metáfora conceptual y representación de conceptos.

La última fuente de evidencia de las influencias del cuerpo en procesos cognitivos que vamos a citar en el presente trabajo se refiere a los estudios sobre metáforas conceptuales. El término metáfora conceptual fue acuñado por Lakoff y Johnson (1980, 1999) y hace referencia a la idea de que los conceptos abstractos están basados en dimensiones más básicas. Estas metáforas nos capacitan para pensar sobre conceptos abstractos ligándolos a sensaciones físicas. De acuerdo con estos autores, sin esas relaciones, los conceptos abstractos carecerían de referencia en el mundo físico y nos dificultaría la tarea de compartirlos con los demás.

Parte de estos estudios se han ocupado de estudiar la relación entre dimensiones espaciales básicas (i.e., izquierda-derecha, delante-detrás, arriba-abajo) con conceptos abstractos como los números (p.ej. Dehaene, Bossini, y Giraux, 1993; para una revisión ver Fias y Fischer, 2005) el tiempo (p.ej., Boroditsky, 2000, Santiago, Lupiañez, Pérez, y Funes, 2007; Torralbo, Santiago, y Lupiañez, 2006) o el afecto (p.ej., Meier y

Robinson, 2004; para una revisión ver Crawford, 2009). Entre estos estudios, uno de especial relevancia para el presente trabajo es el que llevaron a cabo Meier y Robinson (2006). En ese estudio, los autores observaron que los participantes que referían un mayor número de síntomas depresivos mostraban sesgos atencionales hacia las zonas inferiores del campo visual.

Además de estos estudios, muchos otros han encontrado evidencia de que ciertas metáforas comunes en nuestro lenguaje pueden estar asociadas a sensaciones físicas (para una revisión mirar Gibbs, 2006; Isanski y West, 2010; Landau, Meier, y Keefer, 2010; Meier y cols., 2012). Por ejemplo, ha habido trabajos que estudiaron y comprobaron la comúnmente usada metáfora de asociar amabilidad con calidez y rudeza o aislamiento con frialdad (p.ej., Ijzerman y Semin, 2009; Zhong and Leonardelli, 2008). Otros autores han estudiado la metáfora de relacionar la importancia de un argumento con su peso (Jostman, Lakens y Schubert, 2009) o la asociación entre luminosidad y bondad (Meier, Robinson y Clore, 2004).

De especial interés para la conexión entre psicología experimental y clínica son los estudios sobre la relación entre el concepto de moralidad y pureza con sensaciones físicas de limpieza (ver Schnall, 2011). Algunos estudios han encontrado que hacer un *priming* con limpieza puede en ocasiones atenuar los juicios morales y en otras exacerbarlos. Parece que los comportamientos de limpieza disminuyen la culpa que producen las transgresiones morales (Zhong y Liljenquist, 2006) y además parece que la parte con la que se comete la transgresión es la parte que se desea limpiar (Lee y Schwarz, 2010). Hay autores que han propuesto que tal y como el asco es una emoción en principio asociada a los alimentos y probablemente con posterioridad adquirió connotaciones morales, del mismo modo la necesidad de limpieza y orden ha podido evolucionar en un contexto social específico en el que terminó adquiriendo un tinte

moral e incluso ir más allá y servir de bálsamo tras tomar decisiones difíciles (Lee y Schwarz, 2010). Parece plausible que exista un vínculo entre estas cogniciones incorporadas y algunos trastornos psicológicos como el trastorno obsesivo-compulsivo. Un aspecto común en estos trastornos es que los pacientes muestran su preocupación por aspectos relacionados con la limpieza y la pureza moral. Hay cierta evidencia que indica que inducir experiencias de asco endurece los juicios morales de los individuos (Schnall, Haidt, Clore, y Jordan, 2008), mientras que experiencias de pureza los atenúa (Helzer y Pizarro, 2011; Schnall, Benton, y Harvey, 2008). El hecho de que este tipo de representaciones estén corporeizadas puede abrir vías de investigación interesantes para estudiar la ideación obsesiva y mejorar su tratamiento.

Modelos psicológicos y psicopatológicos que le dan un papel al cuerpo.

Modelos multinivel de emoción.

El aspecto común de estos modelos es que tienen como premisa que la información emocional se procesa a diferentes niveles. El papel del cuerpo en estos modelos es doble. Por una parte, estos modelos lo conciben como un sistema de respuesta que ejecuta las reacciones elicitadas por otros sistemas. Por otra parte, se le suponen una serie de vínculos automáticos con el sistema perceptual (lo que Damasio - 1994. conceptualiza como emoción primaria) y la capacidad de poner en marcha esquemas.

Subsistemas cognitivos interactivos (ICS, Teasdale y Barnard, 1993).

En este modelo, los autores proponen la existencia de subsistemas interactivos que están especializadas en el procesamiento de cierto tipo de información. Estos subsistemas están organizados en función de su nivel de abstracción en un modelo de jerarquía semántica.

En el nivel sensorial, el subsistema acústico codifica la información relativa al sonido, el subsistema visual la información visual y el subsistema de estado corporal codifica las entradas sensoriales de dentro del cuerpo, como las sensaciones de presión o dolor, la posición de las partes del cuerpo, así como olores y sabores.

En el nivel intermedio, el subsistema morfonoléxico codifica la descripción estructural de los elementos y las relaciones del espacio acústico, mientras que el subsistema de objeto codifica la descripción estructural de los elementos y las relaciones del espacio visual.

En el nivel de significado, el subsistema proposicional integra la información de los subsistemas morfonoléxico y de objeto en conocimiento descriptivo, mientras que el subsistema implicacional integra la información sensorial con el conocimiento descriptivo, y las entidades mentales resultado de las regularidades del entorno y el cuerpo pueden entenderse como modelos esquemáticos de la experiencia.

Finalmente, este modelo propone un nivel ejecutor con tres subsistemas, el articulatorio, el límbico y el somático-visceral, que implementan los resultados de los subsistemas de los niveles intermedio y de significado.

De especial importancia para este trabajo es que este modelo propone que los estados corporales y la retroalimentación corporal influyen en los procesos cognitivos del nivel implicacional, que está conformado por esquemas, conceptos, normas, valores y otros conocimientos implícitos que no son necesariamente verbales pero que se considera que dirigen nuestro comportamiento.

Modelo de Lindeman y Abramson

Recientemente, Lindeman y Abramson (2008) han propuesto un modelo teórico que describe los mecanismos causales por los que podrían relacionarse elementos somáticos y cognitivos dentro de la depresión. En concreto, estas autoras hacen un resumen de resultados en *embodiment* y sugieren que la desesperanza está conceptualizada metafóricamente como incapacidad motriz y que la simulación de esta incapacidad motriz da lugar a la aparición de síntomas fisiológicos periféricos como el retardo psicomotor o la baja energía.

El modelo propuesto por estas autoras sostiene que algunas emociones aparecen como consecuencia de la simulación de experiencias corporales que integran la conceptualización metafórica de ciertas situaciones (p.ej., sentir opresión en el pecho como consecuencia de la presión social). Los concomitantes fisiológicos de estas emociones derivarían de estas experiencias sensoriomotrices. Aplicado a la depresión, el modelo de simulación metafórica sugiere que la incapacidad de evitar los resultados indeseados o de lograr los deseados está metafóricamente conceptualizada como una incapacidad motriz y que la simulación de esta incapacidad motriz se convierte en un componente sustancial de la desesperanza, dando lugar a sensaciones subjetivas de letargia e inmovilidad y a resultados fisiológicamente objetivables como baja energía o retardo psicomotor.

El modelo propuesto por Lindeman y Abramson (2008) tiene importantes implicaciones para la práctica clínica. Por un lado, la actividad central y periférica puede considerarse como simulaciones metafóricas de ciertos conceptos y cogniciones. Este hecho abre nuevas vías para la identificación de esquemas no adaptativos y sugiere

vías de intervención alternativas que estén menos mediadas por procesos cognitivos abstractos. Por otro lado, el modelo implica que las experiencias corporales de competencia motora pueden resultar útiles para aliviar los síntomas de la depresión. En consonancia con esta última implicación, hay resultados que señalan que el ejercicio físico puede reducir la desesperanza (Hembree, 2001) así como las cogniciones negativas asociadas a la depresión (Lash, 2000). Además, los ejercicios que implican un mayor nivel de competencia motora, como las artes marciales, incrementan las emociones positivas y la autoeficacia de los pacientes en mayor medida que otros ejercicios como pedalear en una bicicleta estática (Bodin & Martinsen, 2004). Puede que el desarrollo de claves que subrayen la competencia motora del sujeto ayude a mejorar la eficacia de las intervenciones psicológicas.

Synergetics

Este modelo fue inicialmente propuesto por Haken (1977) en el ámbito de la física. Recientemente, Haken y Tschacher han transferido algunos de sus principios al campo de la psicología, con el objetivo de desarrollar un modelo teórico que pueda explicar el comportamiento intencional y las dinámicas neurales (Haken & Tschacher, 2010), la actividad cerebral (Haken, 1996) o el funcionamiento cognitivo y comportamental humano (Haken y Tschacher, 2011). Concretamente, estos autores consideran que el comportamiento humano es un ámbito al que se puede aplicar su modelo, ya que, según ellos, los patrones organizativos del comportamiento emergen espontáneamente. De acuerdo con su modelo, el entorno, incluyendo en el mismo los estados y las posturas corporales, constriñen el rango de posibles estados psicológicos de un individuo dado. El comportamiento puede ser entendido como una función de los

cambios en el espacio personal (i.e., variables cognitivas y emocionales de la persona) que está a su vez condicionado por las variables del entorno. De importancia para este modelo es la idea de que para que tenga lugar la aparición espontánea de patrones organizativos estos no pueden estar preinstalados en el sistema, sino que aparecen cuando los mismos patrones son empleados para la percepción y para la categorización de los eventos (en otras palabras, la forma de explicar el comportamiento inteligente y resolver el problema de la intencionalidad es asumir que la cognición es modal). De acuerdo con el modelo de synergetics, las variables corporales deben ser entendidas como parámetros de control de los procesos cognitivos.

Psicoterapias que involucran el cuerpo.

Aunque el presente trabajo se puede encuadrar en la psicopatología experimental, el motivo último del mismo es servir de base para generar nuevas estrategias psicoterapéuticas en el futuro. En este sentido, puede ser interesante examinar el estado de la cuestión en intervenciones psicoterapéuticas, con mayor o menor nivel de validación según el caso, que utilizan el cuerpo como herramienta central de cambio.

Psicoterapia corporal

La psicorterapia corporal es considerada como una rama principal de la psicoterapia. El término se utiliza generalmente para denominar un compendio de métodos y técnicas cuyo denominador común es que el cuerpo juega un papel importante en la práctica psicoterapéutica. Röhrcih (2009, p. 139) define este tipo de

intervenciones como “una perspectiva holística dentro de la estrategia de intervención terapéutica que trabaja explícitamente con técnicas corporales, no verbales”. El paraguas terminológico de psicoterapia corporal recoge diversos enfoques e intervenciones. Si bien la proliferación de términos y técnicas no está muy justificada, habida cuenta del solapamiento conceptual y la similitud en la práctica de algunas intervenciones, los métodos y técnicas de la psicoterapia corporal pueden dividirse en dos grupos. Por un lado, aquellas técnicas e intervenciones orientadas a modificar el comportamiento o a dotar de una mayor capacidad de introspección al paciente (p.ej., Terapia de danza y movimiento, Análisis Bioenergético) y por el otro aquellas técnicas y enfoques cuyo objetivo principal es la relajación y la homeostasis (p.ej., Relajación funcional, Hakomi).

Terapia de danza y movimiento (DMT)

De acuerdo con la definición de la Asociación Británica de Terapia de Danza y Movimiento, “La DMT es el uso en psicoterapia del movimiento y la danza a través del cual el individuo pueda involucrarse de forma creativa en un proceso que facilite la integración de sus áreas emocional, cognitiva, física y social. La DMT se fundamenta en la premisa de que el movimiento refleja la manera de pensar y sentir de la persona”.
La danza es un arte que se practica como una forma de expresión emocional, interacción social y que está presente tanto en rituales litúrgicos como de seducción en diferentes culturas en todo el mundo. Se desconoce el momento exacto en el que la danza comenzó a formar parte de la cultura humana, pero algunos de los yacimientos arqueológicos más antiguos (como las cavernas Bhimbetka) muestran indicios de que ya se practicaba en la prehistoria.

Entre los beneficios de la danza se incluyen la mejora de la condición física, la coordinación, mejora en la expresión rítmica, en la confianza en uno mismo y en la imagen social (p.ej., Alpert, 2011). La DMT se basa en la idea de que el cuerpo y la mente trabajan juntos y de que bailar es una forma de expresar los sentimientos más íntimos de la persona, que a su vez ayuda al individuo a ser consciente de lo que siente a través de las sensaciones y los movimientos.

La evidencia a favor de esta intervención es aún escasa. El metaanálisis de Ritter y Low (1996) hizo una revision de los studios cuantitativos sobre la eficacia de la DMT y estimó el tamaño del efecto de esta intervención. Los autores encontraron tamaños del efecto de pequeños a medianos, concluyendo que la DMT podía ser un tratamiento efectivo para pacientes con sintomatología diversa y en especial para trastornos de ansiedad, si bien reconocieron la necesidad de realizar más estudios con grupo control y utilizar medidas más fiables. Con posterioridad, se han realizado algunos estudios tratando de superar estas limitaciones. Por ejemplo, el estudio de Jeong, Hong, Lee, Park, Kim y Suh (2005) evaluó la salud psicológica y los cambios en el nivel de ciertas neuro-hormonas en un grupo de adolescentes moderadamente deprimidos que siguieron un programa de intervención con DMT durante 12 semanas. Después de 12 semanas, se redujeron todos los indicadores de distrés psicológico en el grupo de DMT y además este grupo mostró mayor concentración de serotonina y menor concentración de dopamina en plasma que los sujetos del grupo control.

Mindfulness

El mindfulness o conciencia plena es una técnica de intervención que se basa en las prácticas de meditación orientales. La técnica consiste en dirigir la atención

deliberadamente hacia el instante presente, tratando de no juzgar y en una actitud de aceptación de los pensamientos, emociones y sentimientos que pudieran aparecer en la conciencia. Es además un estado de conciencia que permite darse cuenta de las sensaciones y experiencias mentales y corporales que tienen lugar en el momento presente.

En mindfulness, la respiración se utiliza como anclaje para el foco atencional. Como la respiración es un proceso automatizado que hacemos en todo momento, se utiliza como un suceso que nos ayuda a focalizar nuestra atención en el cuerpo, sin tratar de controlarla.

En la práctica informal del mindfulness, la respiración también puede ser el foco de atención que nos traiga al momento presente mientras se realizan otras actividades como caminar, escuchar música o esperar a que un semáforo se ponga en verde. El dirigir la atención hacia otras sensaciones corporales, como la fuerza con la que agarramos un vaso o el impulso de las piernas mientras caminamos, también se puede utilizar para estar más consciente del momento presente. En los ejercicios de escaneo corporal la atención se va desplazando por las distintas sensaciones corporales, desarrollando una mayor conciencia de las mismas y permitiendo, mediante la práctica regular, que esta mayor conciencia de las sensaciones corporales se integre en nuestras rutinas diarias.

A lo largo de las últimas décadas, el mindfulness ha llamado la atención tanto de investigadores como de terapeutas como técnica de intervención en trastornos psicológicos. De hecho, aunque el mindfulness puede considerarse por sí mismo como un tipo de intervención, son varios los enfoques que han incorporado prácticas de mindfulness o que están directamente basados en el midfulness (p.ej., Baer, 2003; Germer, Siegel, y Fulton, 2005).

Una de las intervenciones más destacadas que utiliza el mindfulness es la Terapia Cognitiva basada en Mindfulness (MBCT, por sus siglas en inglés; Segal, Williams, y Teasdale, 2002) que se centra en la prevención de recaídas de pacientes que sufren episodios depresivos recurrentes. Además de las técnicas clásicas de intervención cognitivo-conductual, la MBCT utiliza técnicas de mindfulness que incluyen el cuerpo como un elemento que facilita la interrupción de los procesos cognitivos automáticos que pueden desencadenar un nuevo episodio depresivo mayor. La eficacia de la MBCT en el tratamiento de la depresión es similar a la de continuar con la medicación antidepresiva (p.ej., Kuyken y cols., 2009) y también ha demostrado su eficacia en el tratamiento de trastornos de pánico (p.ej., Kim y cols., 2009) de ansiedad social (p.ej., Kocovski, Segal, y Battista, 2009) o de ansiedad generalizada (p.ej., Evans y cols., 2008).

Otra de las intervenciones psicológicas que usa mindfulness es el Programa de Reducción del estrés basado en Mindfulness (MBSR, Kabat-Zinn, 1979). El MBSR se centra en la reducción del estrés para la mejora del bienestar físico y mental en diversos cuadros clínicos. Estudios recientes señalan que la MBSR incrementa la calidad de vida y el bienestar físico en una amplia gama de trastornos. En concreto el entrenamiento en MBSR mejora la capacidad de afrontamiento tanto en situaciones cotidianas como en presencia de trastornos de estrés severo (p.ej., Chang, 2004), adicciones (Altner, 2002), ansiedad (Miller, Fletcher, y Kabat-Zinn, 1995) y también en enfermedades físicas como el cáncer (p.ej., Carlson, 2004) o el dolor crónico (p.ej., Kabat-Zinn, 1982; para un metaanálisis de los beneficios del MBSR en la salud ver Grossmann, Niemann, Schmidt, y Walach, 2004).

Psicoterapia sensoriomotriz

La psicoterapia sensoriomotriz es un modelo de intervención desarrollado por Pat Ogden y sus colaboradores (Ogden, Minton, y Pain, 2006) para el tratamiento de pacientes con trastorno de estrés post-traumático. En comparación con otras intervenciones psicológicas, la terapia sensoriomotriz subraya la importancia de intervenir en el nivel somático, ya que las sensaciones corporales que permanecen activas durante el procesamiento cognitivo constituyen un sesgo que afecta al funcionamiento del individuo, especialmente los procesos de toma de decisiones. Cuando los patrones sensoriomotrices alterados se consolidan, es difícil que las intervenciones cognitivas puedan modificar con éxito las reacciones asociadas a la sobreactivación fisiológica.

Entre otras habilidades, los terapeutas sensoriomotrices se forman en detectar y reconocer micromovimientos corporales y otras señales físicas que indican cambios en las sensaciones corporales o en la activación del sistema nervioso autónomo de los pacientes, con el objetivo de ser capaces de verbalizar estos cambios del mismo modo que reflejan contenidos verbales o emocionales del paciente.

Según estos autores, durante el tratamiento de los pacientes con estrés post-traumático es importante trabajar con sus reacciones defensivas para restablecer un funcionamiento flexible y adaptado. Sufrir un acontecimiento traumático a veces implica que la experiencia de que las reacciones defensivas de la persona no lograron garantizar su seguridad. Durante algunas experiencias traumáticas, las personas se ven forzadas a interrumpir sus reacciones defensivas movilizadoras, adoptando en su lugar defensas de inmovilización y paralizándose. Sin embargo, las reacciones defensivas más activas están aún presentes en los pacientes con trauma, y pueden ser redescubiertas y revitalizadas si se le presta atención al lenguaje corporal de los pacientes, restaurando

con ello su sentimiento de competencia. Un elemento esencial en la psicoterapia sensoriomotriz es identificar y resolver la secuencia de reacciones defensivas que están contribuyendo al mantenimiento de los síntomas. Durante el proceso terapéutico, mediante la observación de las reacciones corporales que se producen cuando se evoca la situación traumática, aparece la posibilidad de reaccionar de forma diferente. Esta respuesta, incipiente en el suceso traumático, se reafirma y se convierte en una respuesta más flexible y adaptada a la circunstancia actual de la persona. Es por tanto de enorme importancia que el terapeuta sea capaz de identificar esas acciones incompletas o no expresadas para ayudar a los pacientes a completarlas y facilitar el desarrollo de nuevas capacidades.

La intervención de la psicoterapia sensoriomotriz está dividida en tres fases. La primera fase del tratamiento tiene como objetivo identificar las reacciones somáticas vinculadas a la hiperactivación o a la hipoactivación, explorar los recursos somáticos actuales y desarrollar nuevos recursos que permitan mantener el nivel de activación dentro de los umbrales de tolerancia de la persona. Durante la segunda fase del tratamiento, las situaciones traumáticas son recordadas mientras se ponen en marcha los recursos aprendidos en la fase anterior. Los objetivos de esta fase son reducir la evitación y las reacciones fóbicas de los pacientes a los recuerdos traumáticos, así como explorar y activar tendencias de acción que estuviesen ocultas, además de implementar los recursos somáticos que permitan regular las respuestas fisiológicas autónomas producidas por las reacciones defensivas inapropiadas que la persona sigue manteniendo. La tercera fase del tratamiento está encaminada a la normalización del funcionamiento cotidiano del paciente en aquellas áreas que pudieran haberse visto afectadas en el curso del trastorno, usando las estrategias y los conocimientos adquiridos en las fases anteriores.

La principal contribución de este modelo de intervención es la de equiparar la relevancia de las intervenciones en el nivel somático a las que se realizan en las áreas emocional y cognitiva del paciente, igualando en importancia las vías de intervención ascendentes y las descendentes. Mediante la inclusión del cuerpo como una vía de intervención en el reprocesamiento de la situación traumática, los terapeutas consiguen actuar directamente sobre las sensaciones y los movimientos corporales, modificando con ello los síntomas de los pacientes y facilitando que estos puedan cambiar sus pensamientos, emociones y creencias.

Conclusiones

La repercusión del *embodiment* en la investigación científica y el interés suscitado en autores de diferentes disciplinas ha aumentado de forma exponencial en los últimos diez años, especialmente en áreas como la neurociencia cognitiva, neurociencia social, la psicología cognitiva, social y evolutiva, la robótica o la psicolingüística (Barsalou, 2010). Aunque no exento de críticas (p.ej., Adams, 2011), el *embodiment* ha sido acogido con entusiasmo por algunos investigadores, hasta tal punto que algunos se han aventurado a afirmar que el *embodiment* puede ser un marco apropiado que permita la unificación de la ciencia psicológica (p.ej., Schubert y Semin, 2009)

En nuestra opinión, y de acuerdo con la evidencia recogida en este repaso general del estado de la cuestión, el *embodiment* puede ser un enfoque útil para enriquecer el conocimiento que se tiene actualmente de los procesos psicológicos. Los conceptos, ideas y resultados experimentales del *embodiment* han tenido un notable impacto en la psicología moderna. Uno de las principales contribuciones de este enfoque ha sido el de redirigir la atención de los investigadores hacia la influencia que

los estados corporales pueden tener en procesos cognitivos y emocionales. Algunos de los resultados anteriormente mencionados tienen implicaciones potenciales, tanto teóricas como prácticas, pero no cabe duda de que es necesario llevar a cabo más investigaciones sobre las posibles influencias de los estados corporales en procesos mentales que estén involucrados o sean al menos parcialmente responsables del desarrollo y mantenimiento de trastornos psicológicos. Consideramos que existe una carencia de estudios en este ámbito y por lo tanto puede resultar de enorme interés tanto para la psicología experimental como para la clínica el tratar de revelar qué influencias pueden tener los estados corporales en los procesos psicológicos relacionados con los trastornos mentales. Además, consideramos que estudios de este tipo pueden ayudar a tender puentes entre ambas disciplinas, haciendo que los resultados de la investigación básica sean más fáciles de trasladar a la práctica clínica. A pesar de que puede ser plausible sugerir que los estados corporales pueden influir el curso de un determinado trastorno, para mantener esta hipótesis es necesario encontrar evidencia que la soporte. Por lo tanto, el objetivo del presente trabajo es explorar si algunos de los movimientos que la literatura señala que pueden afectar a procesos cognitivos o afectivos, pueden influir en procesos psicológicos que se considera que están involucrados en el mantenimiento de trastornos psicológicos.

Para ello, buscamos en primer lugar un proceso psicológico que reuniese tres requisitos importantes. En primer lugar, el proceso diana, o una disfunción del mismo, debía haber sido relacionado en estudios anteriores con el inicio o el mantenimiento de uno o más trastornos psicológicos. En segundo lugar, como uno de los requisitos del presente trabajo es que la contribución al área de conocimiento debe ser novedosa y original, consideramos que se debía cumplir la condición de que la influencia de los estados corporales en el proceso diana hubiera recibido hasta el momento poca o

ninguna atención por parte de los investigadores. Finalmente, como existen varios procesos psicológicos que podrían cumplir ambas condiciones, tuvimos en cuenta la experiencia previa de nuestro grupo de investigación a la hora de seleccionar el proceso diana, considerando que nuestra experiencia previa podía resultar útil para avanzar un paso más en una línea de investigación ya existente. Por lo tanto, teniendo en cuenta y estos tres pre-requisitos, consideramos que el proceso de regulación anímica era un candidato idóneo para el objetivo del presente trabajo. En consecuencia, en las secciones de este trabajo que vienen a continuación vamos a proporcionar información general sobre la regulación emocional, así como la descripción de tres estudios realizados para explorar experimentalmente la influencia de los estados corporales en la regulación del estado de ánimo.

Estudio 2.1

Este estudio es el primero de una serie de tres experimentos encaminados a comprobar si determinados movimientos corporales pudieran jugar un papel en la regulación anímica individuos a los que previamente se les indujo un estado de ánimo triste. En este primer experimento tomamos como referencia los resultados de los estudios de Tom, Petersen, Lau, Burton y Cook (1991) Briñol y Petty (2003), Forster y Strack (1996) o Wells y Petty (1980) que previamente habían documentado la influencia de movimientos verticales o laterales de la cabeza (i.e., asentir o denegar) en otros procesos psicológicos como la formación de preferencias, la seguridad en las creencias propias y la facilitación de la persuasión, o la memoria. Ningún estudio previo había tratado de comprobar si los movimientos de cabeza, que en nuestra cultura tienen una clara implicación positiva (verticales) o negativa (horizontales) podían afectar a un

proceso tan estrechamente relacionado con los trastornos psicológicos como es la regulación emocional. Esta relación cuenta con evidencia robusta que la soporta, por ejemplo Hervás y Vázquez (2013) afirman que el mal funcionamiento de los mecanismos de regulación del estado de ánimo puede jugar un papel importante en el inicio de la depresión así como puede contribuir al mantenimiento de los síntomas depresivos a lo largo del tiempo. Algunos estudios han comprobado que las personas que permanecen un mayor intervalo de tiempo en un estado de ánimo triste tras una inducción tienen más probabilidades de desarrollar síntomas depresivos con el tiempo (Beevers y Carver, 2003). Otros, han documentado que pacientes con depresión permanecen durante más tiempo en un estado de ánimo triste ante los sucesos negativos cotidianos (Peeters, Nicolson, Delespaul, y deVries, 2003) o tras una inducción de estado de ánimo triste (Gilboa y Gotlib, 1997). Incluso los niveles de disforia en personas sin trastornos anímicos se relacionan con una incapacidad para mantener estados de ánimo positivos (McMakin, Santiago, y Shirk, 2009) o para regular los negativos (p.ej., Williams, Fernández-Berrocal, Extremera, Ramos, & Joiner, 2004).

En el presente estudio, hemos explorado si los movimientos de la cabeza, mencionados en la literatura como componentes somáticos de las emociones, pueden modular la influencia de la disforia en la efectividad de las estrategias de regulación emocional. En concreto, tras una inducción de estado de ánimo triste, los participantes fueron aleatoriamente asignados a una de las dos condiciones experimentales. En una de las condiciones, los participantes ejecutaron movimientos verticales de la cabeza, mientras que en la otra ejecutaron movimientos laterales. Se tomaron medidas de los niveles de disforia y ansiedad al comienzo del experimento, así como del estado de ánimo antes y después de la inducción de estado de ánimo y después de la tarea experimental.

Dos son las hipótesis que planteamos en el presente estudio. En primer lugar esperamos que, después de la inducción de estado de ánimo triste, aquellos participantes que habían referido unos niveles de disforia más elevados al inicio del experimento muestren peor capacidad de regulación que los participantes con bajos niveles de disforia. La segunda hipótesis que se planteó es que aquellos participantes que ejecutaran movimientos verticales de cabeza verían facilitada su capacidad de regular su estado de ánimo en mayor medida que aquéllos que hubieran ejecutado movimientos laterales de cabeza.

Método

Participantes.

42 estudiantes universitarios de primeros cursos de la licenciatura en psicología (24% hombres, *M* = 21.4 años).

Estímulos y aparatos.

Para la inducción de estado de ánimo negativo se empleó un procedimiento idéntico al utilizado por Hervás y Vázquez (2013), consistente en la presentación de una pieza musical de Profokiev (Rusia bajo el yugo mongol) y tres escenas negativas que el participante debía imaginar.

Para ayudar a la regulación, se seleccionó una muestra de 25 fotografías del sistema internacional de imágenes afectivas (IAPS, por sus siglas en inglés; Lang, Bradley, y Cuthbert, 2008) que contaban con valencia positiva (*M* = 7.4 en una escala que va de 0 a 10) y un nivel de activación (*arousal*) medio (*M* = 4.9 en una escala que va de 0 a 10).

Cuatro referencias visuales consistentes en un cuadrado verde (23 x 23 mm) en el centro de un rectángulo amarillo (38 x 51mm) fueron emplazados en la sala experimental. Dos enfrente del participante, a unas alturas aproximadas de 1.80 m y 0.8 m respectivamente, y las otras dos a ambos lados del participante, a una altura de 1.2 m.

Medidas.

Se tomaron medidas del estado de ánimo positive y depresivo (EVEA; Sanz, 2001), disforia (Beck Depression Inventory-II; BDI-II; Beck, Steer y Brown, 1996) y ansiedad (Beck Anxiety Inventory; BAI; Beck, Epstein, Brown y Steer, 1988). Los indices de consistencia interna de las escalas en el presente estudio fueron de α = .91, α = .88, α = .83 y α = .93, respectivamente.

Diseño y procedimiento.

Se utilizó un diseño inter-sujeto, en el que se manipuló el movimiento de la cabeza como variable independiente y se utilizó como variable dependiente la eficacia en la regulación emocional, entendida como el cambio en el estado de ánimo. La Figura 1 esquematiza el diseño del experimento y de un ensayo experimental. Una vez completados los cuestionarios, los participantes pasaron por la tarea de inducción de estado de ánimo triste y acto seguido fueron aleatoriamente asignados a una de las dos condiciones experimentales. En las instrucciones de la tarea experimental se solicitó a los participantes que miraran alternativamente dos veces a las referencias visuales situadas frente a ellos arriba y abajo (i.e., condición de asentimiento) o a las situadas a su derecha e izquierda (i.e., condición de denegación) cada vez que una cruz de fijación "+" apareciese en el centro de la pantalla. En ambas condiciones se instruyó a los participantes a que mirasen la imagen que aparecería en la pantalla hasta que apareciese la cruz de fijación. El experimento se presentó en condiciones de ciego experimental, a

los participantes se les informó de que el estudio pretendía examinar cómo influía dirigir la atención hacia zonas periféricas en la memoria visual. Con posterioridad se preguntó a los participantes por cuáles eran, en su opinión, los objetivos del estudio y se comprobó que ninguno fue capaz de adivinar los objetivos del mismo.

El bloque experimental consistía en 50 ensayos. En cada ensayo, una pantalla vacía (1,500 ms) era seguida por una cruz de fijación (4,000 ms), seguida por una de las imágenes afectivas (3,500 ms) y terminando con otra pantalla vacía (2,500 ms).

Finalmente, los participantes pasaron por una inducción de estado de ánimo positivo y se les informó del objetivo del experimento a modo de *debriefing.*

Análisis de datos.

Los análisis de datos se llevaron a cabo utilizando el paquete estadístico SPSS (Chicago, Illinois).

Se llevaron a cabo una serie de pruebas de t de medidas independientes para la comparación de medias para comprobar que ambos grupos no diferían significativamente en las medidas iniciales. Del mismo modo, se utilizó una prueba de t de medidas relacionadas, comparando las puntuaciones en el EVEA antes y después de la inducción del estado de ánimo para corroborar la eficacia de la misma.

Los cambios en las puntuaciones del EVEA antes y después de la tarea experimental se utilizaron como variable dependiente en el modelo de regresión. Para evitar el problema común a las comparaciones entre el pre y el post de la variabilidad en las puntuaciones iniciales, se construyeron indicadores residuales de cambio en el EVEA. Para ello se introdujo en un modelo de regresión simple las puntuaciones en la post-inducción como variables predictoras y las puntuaciones tras la tarea experimental

como variables criterio. Los tres indicadores residuales de cambio en el estado de ánimo (positivo, depresivo y total (positivo - depresivo)) fueron utilizados como variable dependiente en los análisis de regresión múltiple.

Posteriormente, siguiendo los principios estándar para el análisis de moderación de Baron y Kenny (1986), se centró la variable predictora continua (disforia) y se codificó la variable categórica en formato binario (0 = asentir; 1 = denegar). Acto seguido se introdujeron las variables en un modelo polietápico de regresión lineal.

Finalmente se llevaron a cabo análisis de pendientes simples. Estos análisis y sus gráficos correspondientes son recomendados para comprender mejor la interacción entre una variable continua y otra categórica en los análisis de moderación (e.g., Frazier y cols. 2004)

Resultados

Al comienzo del estudio, los participantes de ambas condiciones experimentales no difirieron entre sí en ninguna de las variables observadas (BDI-II, BAI, estado de ánimo positivo, negativo y total, todas las p> .11).

La inducción de estado de ánimo triste produjo un descenso significativo de las puntuaciones en ánimo positivo (M_{T1-T2} = -8.90, p<.001) y total (M_{T1-T2} = -16.57, p<.001), así como un incremento significativo en las puntuaciones de ánimo depresivo (M_{T1-T2} = 7.56, p<.001).

Los resultados de los análisis de regresión se presentan en la Tabla 1.

Tabla 1 Análisis polietápico de regresión sobre los cambios en estado de ánimo positivo, negativo y total tras la tarea experimental (T3).

	β	*t*	ΔR^2
Ánimo			

Negativo (T3)				
	Paso 1			.10*
	Disforia	.32	2.10*	
	Paso 2			.00
	Disforia	.31	2.04*	
	Movimiento	-.05	-.32	
	Paso 3			.07†
	Disforia	.11	.59	
	Movimiento	-.04	-.29	
	Disforia*Movimiento	.33	1.78†	
Ánimo Positivo (T3)				
	Paso 1			.01
	Disforia	-.11	-.68	
	Paso 2			.01
	Disforia	-.12	-.73	
	Movimiento	-.10	-.62	
	Paso 3			.13*
	Disforia	.16	.82	
	Movimiento	-.11	-.72	
	Disforia*Movimiento	-.45	-2.36*	
Ánimo Total (T3)				
	Paso 1			.10*
	Disforia	-.31	-2.05*	
	Paso 2			.00
	Disforia	-.31	-2.02*	
	Movimiento	-.002	-.01	
	Paso 3			.13*
	Disforia	-.04	-.20	
	Movimiento	-.01	-.08	
	Disforia*Movimiento	-.45	-2.48*	

* $p < .05$; † $p < .10$

Como se puede observar en la Tabla 1, la disforia predijo significativamente los cambios en el estado de ánimo depresivo y total, pero no en el estado de ánimo positivo. Todavía más importante, la interacción entre la disforia y el movimiento fue el único predictor significativo de cambio en el estado de ánimo positivo y total, y

marginalmente significativo del cambio en estado de ánimo depresivo. Este resultado nos indica que el tipo de movimiento ejecutado ejerció como moderador de la influencia de los niveles de disforia en la capacidad de regulación emocional.

Los análisis de pendientes simples nos aclaran esta moderación. Entro los participantes que asintieron, el nivel de disforia no apareció como predictor significativo de cambios en el estado de ánimo negativo (β=.14, *p*=.54), positivo (β=.17, *p*=.47), o total (β=-.04, *p*=.87), mientras que entre aquéllos que denegaron con la cabeza, la disforia fue un predictor significativo de cambios en estado de ánimo negativo (β=.50, *p*=.02), positivo (β=-.52, *p*=.02), y total (β=-.69, *p*<.001). Como se había hipotetizado, los movimientos de cabeza moderaron la influencia de la disforia en la regulación emocional. Mientras que entre los participantes que denegaron, altos niveles de disforia se asociaron con peor estado de ánimo tras la tarea experimental, no sucedió así entre aquéllos que asintieron con la cabeza.

Discusión

En congruencia con otros estudios y confirmando la primera hipótesis de éste, hemos encontrado que el nivel de disforia se asocia con dificultades en la regulación del estado anímico. En general, los participantes con un nivel de disforia mayor mostraron menor capacidad de regulación del estado de ánimo que los participantes con un nivel de disforia menor. Todavía más importante, los movimientos de la cabeza moderaron esta relación. Este resultado confirma nuestra segunda hipótesis. Concretamente, la asociación entre niveles de disforia y regulación emocional solo se observó en aquellos participantes que denegaron con la cabeza. El acto de asentir parece que contrarresta el efecto de la disforia en la regulación anímica, mejorando la capacidad regulatoria de los participantes con niveles elevados de disforia.

En este estudio se confirma que algunos movimientos corporales pueden afectar a procesos de orden superior implicados en el desarrollo y mantenimiento de trastornos psicológicos, como es la regulación emocional. Estos resultados son pioneros en la aplicación de los postulados del *embodiment* en ámbitos más cercanos a la psicología clínica. De consolidarse esta línea de investigación en población clínica, podría servir para enriquecer las aproximaciones terapéuticas, mediante la inclusión de componentes corporales y motores en la terapia con el objetivo de modificar la información proprioceptiva, pudiendo con ello conseguir terapias más completas y efectivas.

Estudio 2.2

En el Estudio 1 se ha recogido la evidencia existente acerca de la influencia que tienen algunos movimientos, posturas y gestos corporales en distintos procesos emocionales y cognitivos. En el Estudio 2.1 se ha descrito la importancia de la regulación emocional en relación con el desarrollo y mantenimiento de algunas patologías, además de cómo los movimientos de cabeza pueden estar ejerciendo un papel en el proceso regulatorio, especialmente cuando los participantes presentan niveles altos de disforia. El objetivo del presente estudio es el de ampliar el espectro de movimientos que puedan afectar a la regulación del estado de ánimo. Como hemos visto anteriormente, la literatura del *embodiment* está llena de ejemplos de movimientos y posturas con una influencia en procesos superiores (p.ej., Niedenthal, Barsalou, Winkielman, y Krauth-Gruber, 2005). Al margen de los gestos faciales, uno de los movimientos más estudiados es el de flexión y extensión del brazo. En concreto, estos movimientos de flexion y extension han sido comúnmente asociados con actitudes de aproximación y rechazo hacia distintos objetos, ya que solemos flexionar el brazo para

atraer objetos de nuestro interés, mientras que solemos extenderlo para apartar objetos que nos desagradan. Por ejemplo, en el estudio de Cacioppo, Priester y Bernston (1993) los participantes evaluaron símbolos Chinos mientras mantenían activos bien los músculos flexores o bien los extensores del brazo. Los participantes evaluaron los símbolos como más positivos cuando tenían los músculos flexores activados, que cuando tenían los músculos extensores activados, lo que fue interpretado por los autores como una influencia de las señales corporales asociadas con aproximación y rechazo en la evaluación de caracteres inicialmente neutros. En un estudio complementario al anterior, Chen y Bargh (1999) comprobaron que la relación inversa también se cumplía. Es decir, estos autores observaron que a los participantes de su estudio les era más sencillo flexionar el brazo tras atender a estímulos positivos y extenderlos tras observar imágenes negativas que al revés. Pero aún más relevante para el presente trabajo son los resultados del estudio que llevaron a cabo Wiers, Eberl, Rinck, Becker y Lindenmeyer (2011). En este estudio, los movimientos de flexión y extensión del brazo fueron empleados como parte de un modulo de modificación de sesgos cognitivos (MacLeod, Rutherford, Campbell, Ebsworthy, y Holker, 2002) destinado a modificar el sesgo positivo que los pacientes con alcoholismo presentaban hacia bebidas alcohólicas. En el estudio, los participantes fueron aleatoriamente asignados bien a un grupo experimental en el que se les instruyó para que empujaran una palanca en respuesta a imágenes de bebidas alcohólicas y a que tiraran de la palanca ante imágenes de bebidas no alcohólicas, bien a un grupo control en el que no se les dieron instrucciones o recibieron un entrenamiento ficticio. Los autores observaron que los participantes en la condición experimental mostraron un cambio en su sesgo hacia el alcohol, que pasó de una leve atracción a un moderado rechazo; mientras que los participantes en la condición de control no mostraron cambios en sus tendencias hacia el alcohol. En un seguimiento

posterior un año después de terminar el tratamiento, los investigadores descubrieron que la tasa de recaída de los pacientes en la condición experimental era más baja (46%) que los de la condición de control (59%).

Por lo tanto, como la influencia de los movimientos de flexión y extensión del brazo en otros procesos cognitivos se encuentra bien documentada en la literatura y además hay estudios que indican que su aplicación en intervenciones clínicas puede ser de utilidad para mejorar el resultado de las mismas, se ha considerado que estos movimientos son un candidato perfecto para tratar de extender los resultados hallados en el Estudio 2.1. En este caso, las hipótesis de este estudio son idénticas a las del anterior. Esto es, esperamos que los niveles de disforia afecten a la capacidad de regulación del estado de ánimo y, además, que aquellos participantes que flexionen el brazo vean facilitada su capacidad de regular el estado de ánimo en mayor medida que aquéllos que extiendan su brazo.

Método

Participantes.

40 estudiantes de psicología (35 women, 5 men) con una edad media de 22.3 años.

Estímulos y aparatos.

Tanto la inducción de estado de ánimo como las imágenes positivas de la tarea experimental fueron idénticas a las del estudio anterior. Una palanca con tres posiciones, idéntica a la utilizada en el estudio de Ulrich, Eikmeier, de la Vega, Ruiz Fernández, Alex-Ruf, y Maienborn (2012) fue empleada para que los participantes ejecutaran los movimientos de flexión y extensión del brazo.

Medidas.

Las medidas recogidas fueron las mismas que las del estudio anterior.

Procedimiento y diseño.

El diseño y el procedimiento fueron idénticos a los del estudio anterior, con la salvedad de las instrucciones que se dio a los participantes. A los participantes en la condición de extensión (flexión) se les instruyó a que empujaran (tiraran de) la palanca hasta el extremo distal (proximal) del aparato cuando apareciese una cruz en la pantalla y la mantuvieran en esa posición hasta que desapareciese la imagen que aparecería en la pantalla. Una vez la imagen hubiera desaparecido, los participantes debían retornar la palanca al centro del aparato.

Análisis estadísticos.

Todos los análisis del Estudio 2.2 son análogos a los que se llevaron a cabo para el Estudio 2.1.

Resultados

Los participantes de ambas condiciones no difirieron al comienzo del estudio en ninguna de las variables recogidas (BDI-II, BAI, EVEA positivo, negativo y total, todas las $p > .31$).

La inducción de estado de ánimo triste produjo un descenso significativo de las puntuaciones en ánimo positivo ($M_{T1-T2} = -10.05$, $p < .001$) y total ($M_{T1-T2} = -20.27$, $p < .001$), así como un incremento significativo en las puntuaciones de ánimo depresivo ($M_{T1-T2} = 10.22$, $p < .001$).

Los análisis de regresión arrojaron resultados que contrastan con los obtenidos en el Estudio 2.1. En primer lugar, no se pudo confirmar la hipótesis de que los niveles de disforia afectasen a la regulación emocional, ya que los niveles de disforia no predijeron cambios en el ánimo depresivo (β=.18, *p*=.26) y tan solo predijeron de forma marginalmente significativa cambios en el ánimo positivo (β= -.28, *p*=.08) y total (β=.-29, *p*=.07), si bien es cierto que en la dirección adecuada. El análisis se completó igualmente, ya que cabía la posibilidad de que la ausencia de significación se debiese a una interacción entre el tipo de movimiento y el nivel de disforia. Los resultados de los análisis de moderación se muestran en la Tabla 2. Como se puede observar, ni el nivel de disforia, ni el tipo de movimiento ni la interacción entre ambas resultó ser un predictor significativo de la capacidad de regulación anímica. La segunda hipótesis del presente estudio, que los movimientos de flexión y extensión del brazo pudieran moderar la influencia de los estados disfóricos en la regulación emocional no pudo ser confirmada.

Tabla 2. Análisis polietápico de regresión sobre los cambios en estado de ánimo positivo, negativo y total tras la tarea experimental (T3).

		β	*T*	ΔR^2
Ánimo Negativo (T3)				
	Paso 1			.03
	Disforia	.18	1.16	
	Paso 2			.04
	Disforia	.18	1.15	
	Movimiento	-.19	-1.21	
	Paso 3			.00
	Disforia	.24	1.14	
	Movimiento	-.11	-.41	
	Disforia*Movimiento	-.12	-.41	
Ánimo Positivo (T3)				
	Paso 1			.08†

	Disforia	-.28	-1.81†	
	Paso 2			.00
	Disforia	-.28	-1.78†	
	Movimiento	.03	.20	
	Paso 3			.01
	Disforia	-.19	-.93	
	Movimiento	.17	.64	
	Disforia*Movimiento	-.19	-.65	
Ánimo Total (T3)				
	Paso 1			.08†
	Disforia	-.29	-1.86†	
	Paso 2			.01
	Disforia	-.29	-1.85†	
	Movimiento	.12	.75	
	Paso 3			.00
	Disforia	-.27	-1.30	
	Movimiento	.15	.56	
	Disforia*Movimiento	-.04	-.13	

† $p < .10$

Discusión

El Estudio 2.2 tenía como objetivo extender los resultados del estudio anterior a otro tipo de movimientos corporales, en este caso, movimientos de flexión y extensión del brazo. Los resultados obtenidos no han permitido confirmar las hipótesis propuestas al inicio del estudio. A pesar de haber encontrado una tendencia, los niveles de disforia al inicio del estudio no predijeron significativamente la capacidad de regulación de los participantes. La no significancia de este resultado puede ser debida a diferencias en la composición de la muestra. Si en el Estudio 2.1 cerca de la mitad de los participantes (47,6%) obtuvieron puntuaciones iguales o mayores a 10, en el Estudio 2.2, solo un 22,5% obtuvieron puntuaciones similares. Los individuos disfóricos parecen estar

infrarrepresentados en este último estudio y este hecho puede explicar que los resultados no alcanzaran la significación estadística.

La segunda hipótesis no se vio respaldada por los resultados. Los movimientos de flexión y extensión del brazo no desempeñaron ningún papel en la regulación emocional de los participantes bajo las condiciones experimentales descritas. Una posible explicación para la falta de resultados es que la asociación flexión-aproximación y extensión-rechazo es culturalmente dependiente, dándose en poblaciones anglosajonas pero no en población española. Hasta donde sabemos, no existe un estudio que haya replicado los resultados de, por ejemplo, Cacioppo y cols. (1993) con muestra española. Además, algunos estudios sugieren que ciertos elementos contextuales, como la valencia del estímulo al que se reacciona, pueden afectar al sentido que tiene un movimiento de flexión y extensión del brazo (p.ej., Centerbar y Clore, 2006). En este caso, el hecho de solo haber utilizado estímulos positivos, puede haber afectado a la forma en que el movimiento repercute en otros procesos. Otra posible explicación es que los movimientos de cabeza del Estudio 2.1 tengan una asociación mucho más unívoca con la aceptación y el rechazo que los movimientos del brazo del Estudio 2.2.

En resumen, en el estudio 2.2 se encontró una tendencia en la dirección pronosticada indicando que los niveles de disforia al inicio del experimento predecían de forma marginalmente significativa la capacidad regulatoria de los participantes. Sin embargo, no se encontró evidencia que apoyase la hipótesis de que los movimientos del brazo afectasen directa o indirectamente a la regulación del estado de ánimo.

Estudio 3

Si en el Estudio 2.2 se pretendió ampliar el catálogo de movimientos que pudieran estar implicados en la regulación emocional, sustituyendo los movimientos de cabeza por movimientos de flexión y extensión del brazo, el presente estudio tiene como objetivo estudiar los mecanismos a través de los cuáles los movimientos de cabeza influyen en la regulación emocional.

Si bien la mayoría de la literatura previa sobre la influencia de los movimientos de cabeza en procesos psicológicos provienen del ámbito de la persuasión (p.ej., Briñol y Petty, 2003; 2007; Briñol, Petty, y Wagner, 2011; Förster, 2004; Förster y Strack, 1996; Neumann y Strack, 2000; Tom, Petersen, Lau, Burton, y Cook, 1991; Wells y Petty, 1980), han sido propuestos varios mecanismos a través de los cuáles se produce dicha influencia. Algunos autores proponen un mecanismo directo de influencia de los movimientos de cabeza en los cambios de actitud, pudiendo servir los movimientos como una clave para el cambio (Tom et al., 1991). Otros autores proponen un mecanismo más indirecto para explicar esta influencia. Por ejemplo, Wells y Petty (1980) proponen que los movimientos verticales (laterales) de la cabeza facilitan la aparición de pensamientos positivos (negativos) y dificultan la aparición de pensamientos negativos (positivos). Briñol y Petty (2007), por su parte, proponen cinco posibles mecanismos, algunos de ellos indirectos, otros más directos, mediante los cuales los movimientos de cabeza pueden influir en el cambio de actitud. Aunque los resultados de la investigación en persuasión no puedan ser directamente extrapolables a la investigación en regulación emocional, sí es plausible el pensar que algunas de las vías de influencia mediante las que los movimientos de cabeza afectan a la persuasión, puedan ser lo suficientemente amplias como para tener repercusión en otros procesos psicológicos como la regulación emocional.

En el estudio 2.1 se halló una influencia indirecta de los movimientos de cabeza en la regulación emocional. En concreto, los movimientos de cabeza moderaron la relación entre el nivel de disforia y la capacidad de los participantes de regular las emociones. Sin embargo, en el estudio 2.1 no se halló evidencia a favor de una influencia directa de los movimientos de cabeza en la regulación emocional. Los resultados de algunos estudios sugieren que la variación de algunos de los parámetros del experimento (p.ej., la valencia de la información presentada) pueden modular la influencia que ciertos estados corporales tienen sobre las actitudes de los individuos (p.ej., Briñol y Petty, 2003; Centerbar y Clore, 2006). En el estudio 2.1 se presentaron imágenes positivas a los participantes mientras ejecutaban los movimientos de cabeza. Bajo estas condiciones, se encontró una influencia indirecta, que no directa, de los movimientos de cabeza en la regulación emocional. No obstante, los resultados de varios estudios previos indican que prestar atención a información positiva mejora la capacidad de los individuos de regular sus estados de ánimo (p.ej. Fredrickson y Levenson, 1998; Sánchez, Joormann, Marker, LeMoult, y Vázquez, 2013). Por lo tanto, al mejorar la capacidad regulatoria de los sujetos debido a la presencia de estímulos de valencia positiva, es posible que se haya producido un efecto techo que haya enmascarado una posible influencia directa de los movimientos de cabeza en la regulación emocional.

El objetivo del presente estudio es el de tratar de revelar si los movimientos de cabeza pueden, bajo otras circunstancias, tener una influencia directa sobre la regulación emocional. Para ello, en este estudio se sustituyeron las imágenes positivas de los estudios 2.1 y 2.2 por imágenes de caras neutrales extraidas de la base de datos FACES (Ebner, Riediger, y Lindenberger, 2010).

Además, se introdujeron dos cambios con respecto a los estudios anteriores. En primer lugar, al observarse que el número de sujetos disfóricos afectaba a la significación estadística de los contrastes, se aumentó el tamaño muestral en un 30% respecto a los estudios anteriores (N = 52). En segundo lugar, se recogieron medidas adicionales de cambio emocional mediante el uso de la escala de afecto positivo y negativo (PANAS; Positive and Negative Affect Scales; Watson, Clark, y Tellegen, 1988).

La primera hipótesis del estudio coincide con la de estudios anteriores. Esto es, esperamos que los niveles de disforia de los participantes afecten a su capacidad de regular el estado anímico. La segunda hipótesis que planteamos es que las nuevas condiciones experimentales facilitarán la aparición de una influencia directa de los movimientos corporales en la capacidad de regulación emocional de los participantes. Por último, esperamos hallar una interacción entre los niveles de disforia y el movimiento ejecutado similar a la encontrada en el Estudio 2.1.

Método

Participantes.

52 estudiantes de psicología (40 mujeres, 12 hombres) con una edad media de 20,77 años. Un participante (0,5%) no completó el estudio y fue excluido y otros tres (1,5%) adivinaron el propósito del experimento y fueron igualmente excluidos de los análisis. Los análisis se hicieron sobre los 48 casos válidos.

Estímulos y aparatos.

La inducción de estado de ánimo fue idéntica a la de los estudios anteriores. En lugar de las 25 imágenes positivas del IAPS, se emplearon en la tarea experimental 25 imágenes de caras neutrales de la base de datos FACES (Ebner, Riediger, y Lindenberger, 2010). Las referencias visuales fueron las mismas que las utilizadas en el Estudio 2.1.

Medidas.

Las medidas recogidas fueron las mismas que las de los estudios anteriores, añadiendo la medida de las escalas de afecto positivo y negativo (PANAS; Positive and Negative Affect Scales; Watson, Clark, y Tellegen, 1988). La PANAS es una escala que contiene 20 ítems, divididos en dos subescalas. Una de ellas con 10 ítems referentes a emociones positivas (p.ej. Ilusionado, Inspirado) y la otra con 10 de emociones negativas (p.ej., Avergonzado, Irritable), que el sujeto debe contestar en qué medida siente en ese mismo momento de acuerdo a una escala tipo likert de 5 puntos, de “Muy ligeramente o nada” a “Mucho”.

Procedimiento y diseño.

El diseño y el procedimiento fueron idénticos a los del Estudio 2.1, con la salvedad antes mencionada de las imágenes de la tarea experimental.

Análisis estadísticos.

Todos los análisis del Estudio 3 son análogos a los que se llevaron a cabo para el Estudio 2.1.

Resultados

Los participantes de ambas condiciones no difirieron al comienzo del estudio en ninguna de las variables recogidas (BDI-II, BAI, EVEA negativo y total, y PANAS todas las $p > .23$), salvo en la puntuación en la subescala positiva del EVEA que fue significativamente mayor [$t(46) = 2{,}38$; $p = .02$] en los participantes del grupo de movimientos verticales (27.52) que en el de movimientos horizontales (22.52).

La inducción de estado de ánimo triste produjo un descenso significativo de las puntuaciones en afecto positivo [$M_{T1-T2} = -7.46$; $t(46) = 6.49$; $p < .001$], estado de ánimo positivo [$M_{T1-T2} = -10.88$; $t(46) = 9.76$; $p < .001$] y total [$M_{T1-T2} = -20.94$; $t(46) = 9.97$; $p < .001$], así como un incremento significativo en las puntuaciones de afecto negativo [$M_{T1-T2} = 6.46$; $t(46) = -5.91$; $p < .001$] y ánimo depresivo [$M_{T1-T2} = 10.06$; $t(46) = -7.65$; $p < .001$].

Los resultados obtenidos en los análisis de regresión, recogidos en la Tabla 3, contrastan con los hallados en el Estudio 2.1. En primer lugar, no se pudo confirmar la hipótesis de que los niveles de disforia afectasen a la regulación emocional, ya que los niveles de disforia, entendidos como la puntuación en el BDI-II al inicio del experimento, no predijeron cambios ni en el afecto ni en el estado de ánimo (Todas las β entre .14 y -.08, con $p > .33$ en todos los casos). El movimiento realizado tampoco mostró tener una influencia en el cambio afectivo ni en el del estado anímico (ps > .19). Y tampoco se encontró una interacción significativa entre el movimiento y el nivel de disforia (ps > .69), salvo en el caso del afecto negativo, donde apareció una interacción marginalmente significativa [$t(46) = -1{,}75$, $p = .09$]. Al no encontrarse efecto de moderación, no se realizaron los análisis de pendientes.

Tabla 3. Análisis polietápico de regresión sobre los cambios en afecto positivo y negativo, y estado de ánimo positivo, negativo y total tras la tarea experimental (T3).

	β	*t*	ΔR^2

Ánimo Negativo (T3)				
	Paso 1			.02
	Disforia	.14	.97	
	Paso 2			.02
	Disforia	.15	1.01	
	Movimiento	-.15	-1.04	
	Paso 3			.00
	Disforia	.13	.63	
	Movimiento	-.15	-1.03	
	Disforia*Movimiento	.02	.12	
Ánimo Positivo (T3)				
	Paso 1			.00
	Disforia	-.01	-.08	
	Paso 2			.04
	Disforia	-.01	-.04	
	Movimiento	-.20	-1.33	
	Paso 3			.004
	Disforia	.05	.26	
	Movimiento	-.20	-1.32	
	Disforia*Movimiento	-.08	-.41	
Ánimo Total (T3)				
	Paso 1			.01
	Disforia	-.10	-.65	
	Paso 2			.002
	Disforia	-.09	-.63	
	Movimiento	-.04	-.27	
	Paso 3			.003
	Disforia	-.04	-.19	
	Movimiento	-.04	-.27	
	Disforia*Movimiento	-.08	-.37	
Afecto Negativo (T3)				
	Paso 1			.005
	Disforia	.07	.46	
	Paso 2			.004
	Disforia	.07	.47	
	Movimiento	-.06	-.41	

	Paso 3			.07†
	Disforia	.32	1.57	
	Movimiento	-.06	-.41	
	Disforia*Movimiento	-.36	-1.75†	
Afecto Positivo (T3)				
	Paso 1			.006
	Disforia	-.08	-.54	
	Paso 2			.003
	Disforia	-.08	-.55	
	Movimiento	.05	.35	
	Paso 3			.002
	Disforia	-.04	-,18	
	Movimiento	.05	,35	
	Disforia*Movimiento	-.06	-,30	

† $p < .10$

Discusión

En el Estudio 3 no se halló evidencia en favor de la hipótesis que sostenía que los niveles de disforia afectarían a la capacidad de regulación emocional y del estado de ánimo de los participantes. En presencia de imágenes neutrales, los participantes disfóricos se recuperaron de la inducción de estado de ánimo triste tan bien como los no disfóricos. Este hallazgo resulta muy interesante, ya que parece que la influencia que los síntomas de disforia tienen sobre la regulación anímica está restringida al efecto incremental que se da cuando se presenta información positiva. Esto sugiere que los mecanismos responsables de la recuperación del estado de ánimo que se activan en presencia de información neutral son, al menos parcialmente, diferentes de aquéllos que se ponen en funcionamiento ante información positiva. Además, parece que solo éstos últimos están afectados en individuos con niveles subclínicos de depresión.

Tampoco se halló evidencia de que los movimientos de cabeza tuvieran una influencia directa sobre la regulación emocional. Junto con los resultados de los

experimentos 2.1 y 2.2, este resultado sugiere que los estados corporales parecen influir de forma indirecta, aunque no directa, en los procesos de regulación emocional.

Por último, tampoco se halló interacción significativa entre los movimientos de cabeza y los niveles de disforia. Este resultado sugiere que el mecanismo a través del cual los estados corporales ejercen su influencia, solo parece estar activo en presencia de información positiva. Junto con el resultado del Estudio 2.1, este resultado sugiere la existencia de un vínculo entre los estados corporales y sesgos de atención o de interpretación (Hertel & Mathews, 2011) o con el funcionamiento del BAS (Hervás & Vázquez, 2013), apoyando la idea de que los estados del cuerpo tienen una influencia indirecta sobre los procesos de regulación anímica.

Discusión general

En los apartados anteriores se ha introducido el marco teórico del *embodiment,* la literatura científica que lo delimita, así como tres estudios encaminados a examinar la influencia de los movimientos corporales en la regulación anímica. En esta sección trataremos de resaltar las implicaciones de los resultados de los tres estudios y la influencia que pensamos que la perspectiva del *embodiment* puede tener sobre la psicología clínica.

En el Estudio 2.1 se confirmaron ambas hipótesis. Por un lado, hallamos que los niveles iniciales de disforia se relacionaron con la capacidad de regulación anímica de los participantes. Aunque esta relación ya ha sido sugerida por otros autores (p.ej., Teasdale, 1988), aún son pocos los trabajos que han aportado evidencia en esta dirección (p.ej., McMakin, Santiago, y Shirk, 2009; Peeters, Nicolson, Delespaul, y deVries, 2003). Nuestro estudio aporta evidencia en favor de la idea que sostiene que las

personas con altos niveles de disforia presentan mayores dificultades a la hora de regular su estado anímico.

Particularmente relevante y novedoso es el resultado hallado en el Estudio 2.1 que sugiere que los movimientos de la cabeza pueden ejercer un papel moderador en la relación entre los niveles de disforia y la capacidad de regulación anímica de los individuos. Si bien los movimientos de cabeza no parece que afectaran a aquellos participantes con bajos niveles iniciales de disforia, no sucedió igual entre aquellos participantes que reportaron niveles iniciales de disforia más elevados. Entre los participantes inicialmente disfóricos, aquellos que ejecutaron movimientos verticales de cabeza mientras veían imágenes con valencia positiva, mostraron una capacidad regulatoria similar a la de los participantes no disfóricos. Por el contrario, los participantes disfóricos que ejecutaron un movimiento lateral de la cabeza mientras veían las mismas imágenes con valencia positiva no regularon su estado anímico de forma tan eficiente como el resto.

Los resultados del Estudio 2.1 son contribuciones originales y novedosas a la literatura ya existente. Los estudios 2.2 y 3 tuvieron como objetivo ampliar los resultados del estudio anterior. En concreto, el Estudio 2.2 tenía como objetivo explorar otros movimientos asociados con aproximación o rechazo que pudieran ejercer una influencia similar a la de los movimientos de cabeza en la regulación emocional. El Estudio 3, por su parte, tenía como objetivo esclarecer si la influencia de los movimientos de cabeza en la regulación emocional pudiera ser directa, si es sólo indirecta, y si se mantiene estable independientemente de las condiciones experimentales.

En el Estudio 2.2 encontramos una tendencia en la dirección esperada, apoyando la hipótesis de que el nivel inicial de disforia está relacionado con la dificultad de los participantes de regular su estado de ánimo. El hecho de que los participantes disfóricos estuvieran infrarrepresentados en este estudio en comparación con el anterior puede explicar la disminución en la significación estadística.

La segunda hipótesis del estudio, sin embargo, no halló respaldo en los resultados obtenidos. Los movimientos del brazo no afectaron directamente ni moderaron la influencia de los niveles de disforia en la regulación del estado de ánimo. Aunque exento de significación estadística, el resultado no está exento de significado. Este resultado puede indicar que solo movimientos de elementos corporales centrales (como los movimientos de cabeza), no los periféricos (como los movimientos del brazo) tienen suficiente repercusión como para modificar la capacidad de regular el estado de ánimo. Haciendo un breve repaso a la literatura, hay muchos más estudios que encuentran una influencia de elementos corporales centrales en procesos emocionales (p.ej., Briñol y Petty, 2003; 2007; Duclos y Laird, 2001; Harmon Jones y Peterson, 2009; Niedenthal, 2007; Wilson y Pepper, 2004), que de elementos periféricos (p.ej., Cacioppo y cols., 1993; Maxwell y Davidson, 2007) y entre estos últimos, los resultados no son siempre unívocos (e.g., Centerbar y Clore, 2006; Rottevel y Phaf, 2004). Otra explicación podría ser que solo aquellos estados corporales ontológicamente relacionados con las emociones (como los gestos faciales o la postura) o aquellos con una asociación unívoca con aceptación o rechazo (como los movimientos de cabeza), son capaces de influir, al menos de forma indirecta, en la regulación anímica. La mayor parte de los movimientos son actos contextualizados, y las condiciones del contexto pueden afectar a cómo esos movimientos afectan a las actitudes (Centerbar y Clore, 2006). Con independencia del contexto, en nuestra cultura los movimientos verticales

de cabeza implican aprobación o aceptación mientras que los laterales implican negación o rechazo. Por el contrario, aunque los movimientos del brazo pueden estar relacionados con atraer hacia uno objetos deseados, como sugieren Cacioppo y colaboradores (1993), es fácil encontrar ejemplos en los que se flexiona el brazo con otra intención, como la de evitar dolor o la de protegerse de un golpe. Y lo mismo sucede con el movimiento de extensión del brazo, que según el contexto puede implicar evitación (apartar algo indeseable) o aproximación (dar un regalo). En este caso, la influencia del contexto es mayor que en el caso de los movimientos de cabeza.

Aunque en el Estudio 2.2 solo se encontrasen resultados marginalmente significativos en favor de la primera hipótesis, en nuestra opinión el volumen de investigación que esta línea puede dar es bastante extenso. Son muchos los movimientos y posturas cuya influencia puede estudiarse y, además de la regulación emocional, son muchos los procesos emocionales implicados en el mantenimiento de los trastornos en los que merece la pena estudiar las influencias de los movimientos y estados corporales.

En el Estudio 3 se sustituyeron las imágenes positivas de los estudios 2.1 y 2.2 por estímulos neutrales, con la expectativa de que este cambio revelase, en caso de existir, una influencia directa de los estados corporales en la regulación anímica que hubiera estado oculta en los estudios previos debido a un efecto techo provocado por la presencia de estímulos positivos.

La primera hipótesis del Estudio 3 preveía encontrar una relación entre los niveles iniciales de disforia de los participantes y su capacidad de regular el estado de ánimo. En comparación con los resultados obtenidos en los estudios 2.1 y 2.2, en el Estudio 3 no se encontró esta relación. Este resultado indica que no hay diferencias en la

capacidad de regular el estado de ánimo entre sujetos disfóricos y no disfóricos cuando los participantes observan material neutral tras una inducción de estado de ánimo triste.

Junto con los resultados del Estudio 2.1, estos resultados sugieren que la influencia que los movimientos de cabeza pueden tener en la regulación anímica no es directa. Tal vez se obtuviese un resultado distinto manipulando estados corporales que aparecen espontáneamente con los estados de ánimo tristes (como las expresiones faciales o la postura cargada de hombros), aunque esta es una cuestión para una futura investigación.

Por tanto, el efecto encontrado de los movimientos de cabeza no se produce directamente sobre el estado de ánimo, sino a través de una vía alternativa que parece requerir de la presencia de información positiva. Una cuestión de gran interés que tal vez futuros estudios puedan resolver es cuál es esta vía alternativa, o de otra forma, el mecanismo o mecanismos psicológicos involucrados en este efecto. Nosotros proponemos tres posibles vías alternativas de influencia, siendo éstas no excluyentes. La primera, de acuerdo con los modelos multinivel de emoción y en especial con el modelo de Teasdale y Barnard (1993), es que existe una influencia recíproca entre los estados corporales y el sistema implicacional que es en parte responsable del mantenimiento de los síntomas depresivos (Estados corporales→ Sistema Implicacional→ Efectos corporales y somático-viscerales→ Estados corporales; Teasdale y Barnard, 1993, p. 127). Una explicación, por tanto, podría ser que ejecutar movimientos verticales (laterales) de cabeza produjese una retroalimentación corporal positiva (negativa), incongruente (congruente) con la información operativa en el nivel implicacional, que interrumpe (mantiene) el bucle somático-implicacional negativo, en parte responsable del mantenimiento de los síntomas de depresión.

La segunda vía de influencia alternativa por la que proponemos que los movimientos de cabeza pueden ejercer su papel moderador, es mediante su repercusión en el sistema de aproximación conductual (BAS, por sus siglas en inglés). La activación del BAS se asocia con conductas de aproximación hacia objetivos deseables y búsqueda de refuerzo (Hervás y Vázquez, 2013). Varios son los autores y los modelos que relacionan una baja activación del BAS con la depresión unipolar (p.ej., Clark y Watson, 1991; Depue e Iacono, 1989; Pinto-Meza et al., 2006). Algunos estudios han encontrado que los pacientes con depresión muestran una baja reactividad general tanto a estímulos positivos (p.ej., Berenbaum y Oltmanns, 1992; Rottenberg, Kasch, Gross, y Gotlib, 2002) como a recompensas (Henriques y Davidson, 2000; Henriques, Glowacki, y Davidson, 1994; McFarland y Klein, 2008). Hallazgos similares se dan cuando las muestras se componen de participantes con disforia subclínica, lo que apoya la idea de que el reducido interés en experiencias positivas puede ser el elemento que condicione la desregulación del estado anímico y el mantenimiento de la anhedonia (Hervás y Vázquez, 2013). En el Estudio 2.1, los participantes realizaron movimientos verticales o laterales de cabeza mientras veían imágenes de contenido positivo. Realizar movimientos verticales de cabeza está comúnmente asociado con aceptación o aproximación, mientras que relalizar movimientos laterales está asociado con negación o rechazo (e.g., Fusaro, Harris, y Pan, 2012). Por lo tanto es posible que la información proprioceptiva producida por los movimientos verticales de cabeza haya podido activar el BAS, hipoactivo en los pacientes disfóricos, propiciando una mejor respuesta a la información positiva y, como consecuencia, una mejor regulación anímica. La tercera vía de influencia que proponemos es que los movimientos de cabeza puedan contribuir a la modificación de sesgos cognitivos. Es conocida la contribución que ciertos sesgos atencionales, de interpretación o de memoria tienen en el desarrollo y mantenimiento de

trastornos emocionales (Hertel y Mathews, 2011; Mathews y MacLeod; 2005; Matt, Vázquez y Campbell, 1992). Por ejemplo, en comparación con individuos con baja ansiedad, las personas con elevada ansiedad tienden a dirigir su atención hacia estímulos amenazantes más que a estímulos neutrales (Bar-Haim, Lamy, Pergamin, Baker-mans-Kranenburg, y van Ijzendoorn, 2007). Análogamente, mientras los sujetos sin síntomas de depresión atienden mayoritariamente a estímulos positivos, los sujetos deprimidos muestran sesgos hacia información congruente con su estado de ánimo (p.ej., Hankin, Gibb, Abela, y Flory, 2010; Joormann y Gotlib, 2007). De hecho existe una línea de investigación (modificación de sesgos cognitivos, CBM por sus siglas en inglés; Koster, Fox, & MacLeod, 2009) que examina la utilidad de emplear tareas cognitivas cuya práctica reiterada conduzca a una modificación de dichos sesgos en sujetos vulnerables a trastornos emocionales o de ansiedad. Alguno de estos estudios ha demostrado la utilidad de incluir en estas tareas elementos corporales relacionados con la aproximación o la evitación. Por ejemplo, en el estudio de Wiers, Eberl, Rinck, Becker, y Lindenmeyer (2011) los participantes, en este caso pacientes alcohólicos, que ejecutaron movimientos de rechazo (aproximación) ante imágenes de bebidas alcohólicas (no alcohólicas), no sólo presentaron un sesgo menos positivo hacia al alcohol, sino que su tasa de recaída seis meses después fue menor que la del grupo control. Los resultados del Estudio 2.1 pueden reflejar una modificación de los sesgos cognitivos de los participantes disfóricos. En concreto, sugieren la posibilidad de que los pacientes disfóricos, que tienen menor tendencia a prestar atención a información positiva (p.ej., Joormann y Gotlib, 2007), hayan modificado sus sesgos como consecuencia del movimiento de aproximación ejecutado (i.e., movimiento vertical de cabeza), bien prestando más atención a la información positiva, bien cambiando su actitud hacia la misma, bien una combinación de ambas.

En conjunto, estos resultados son acordes con algunas propuestas teóricas. Por ejemplo, la hipótesis del marcador somático de Damasio (1994, p. 199) sostiene que *"cuando distintos marcadores somáticos se yuxtaponen a diferentes combinaciones de imágenes, modifican la manera en que el cerebro las manipula, y de este modo opera como una predilección o sesgo."* Tanto esta propuesta como nuestros resultados están de acuerdo con la hipótesis de la 'embodied validation'. Como sugieren Briñol, Petty y Wagner (2011, p.1043) *"...la confianza que emerge del propio cuerpo y de su posición y sus movimientos puede magnificar el efecto de cualquier información que actualmente esté presente en la mente, incluyendo […] cogniciones, emociones, metas y demás. Esto es, la confianza se aplica a cualquier contenido mental que esté disponible y sea prominente en un momento determinado"*. Ambas propuestas sugieren que los estados corporales pueden alterar la influencia que el procesar cierta información puede ejercer sobre la cognición o la emoción. De acuerdo con nuestros resultados, los movimientos de cabeza realizados interactúan con el tipo de información presentada y con el estado de disforia inicial de los individuos, dando lugar a un aumento o una disminución de la capacidad del individuo de regular su estado de ánimo.

Contribuciones del *embodiment* a la psicología aplicada.

Como se ha descrito a lo largo del presente trabajo, el *embodiment* puede tener importantes implicaciones, tanto teóricas como prácticas, en el campo de la psicología clínica. Por una parte, considerar el papel que el cuerpo puede ejercer en distintos procesos mentales puede ayudar a los psicólogos a adoptar un enfoque más integrador y holístico a la hora de analizar el funcionamiento emocional y cognitivo de las personas. El modelo de Lindeman y Abramson (2008) es un claro ejemplo de la aportación del *embodiment* a la psicología clínica. Este modelo, que sugiere que la simulación de incapacidad motriz puede subyacer a los síntomas motrices que muestran algunos

pacientes con depresión, emana directamente de los principios de teóricos de esta aproximación. Los resultados del presente trabajo, señalan que la posible influencia del cuerpo va más allá de lo que propone este modelo, sugiriendo que la ejecución de ciertos movimientos corporales puede tener efectos sobre otros procesos psicológicos (p.ej., la regulación anímica) que están relacionados con el desarrollo y mantenimiento de trastornos como la depresión. Por lo tanto, sin menoscabo a la posibilidad de que la simulación de incapacidad motriz pueda explicar los síntomas psicomotrices que son frecuentes en la depresión, parece que la influencia de los estados corporales en procesos cognitivos superiores relacionados con la depresión puede ir más allá y es un área en la que aún queda mucho por explorar. Igualmente, ciertos conceptos y nociones que tienen su origen en la corriente del *embodiment* pueden enriquecer modelos teóricos explicativos de los trastornos de ansiedad. Por ejemplo, se puede considerar la teoría de la incubación de Eysenck (1968) Esta teoría señala que, en ocasiones, la respuesta condicionada que se desencadena con la presencia del estímulo condicionado, aún cuando este se presente repetidamente sin la presencia del estímulo incondicionado, puede tener la suficiente fuerza como para impedir el fenómeno de la extinción. La simulación de los componentes modales, y en especial de los componentes somáticos, de las respuestas nocivas, puede predisponer a los individuos a un proceso de incubación, actuando como un marcador somático (Damasio, 1994) y sesgando o exacerbando la percepción de peligro. De acuerdo con los resultados obtenidos por Duclos y Laird (2001), que encontraron diferencias individuales en el impacto que mantener ciertas posturas corporales y gestos faciales tenía sobre el estado emocional, es posible que no solo la fuerza de la respuesta condicionada, sino también la sensibilidad del individuo a sus propios estados internos, sea parcialmente responsable de que el individuo desarrolle un proceso de incubación. El concepto de incubación

puede asímismo conectarse con la idea de que ciertas experiencias traumáticas pueden ser memorizadas como sensaciones corpóreas (Van der Kolk, McFarlane y Weisaeth; 1996) una propuesta que es aceptada por distintos enfoques terapéuticos (p.ej., la psicoterapia sensoriomotriz, el psicodrama, el hakomi) que resaltan la importancia de intervenir en el plano somático con pacientes que han sufrido experiencias traumáticas.

La corriente del *embodiment* sostiene que la reactivación de la información multimodal es lo que da lugar a los procesos cognitivos y emocionales superiores. Es una idea que está en consonancia con el funcionamiento cognitivo y emocional propuesto por los modelos multinivel de las emociones (Philippot, Baeyens, Douilliez, y Francart, 2004; Power y Dalgleish, 1997; 2008; Teasdale y Barnard, 1993). A pesar del interés teórico de estos modelos, el volumen de estudios que han generado ha sido más bien escaso, probablemente debido a la gran complejidad de los mismos. Estudios que utilicen paradigmas provenientes de la corriente del *embodiment*, como los incluidos en el presente trabajo, pueden ayudar a encontrar mayor evidencia a favor de los postulados de los modelos multinivel de emoción.

Es importante resaltar que algunos de estos paradigmas han sido empleados con éxito en trabajos encaminados a la modificación del sesgo positivo hacia el alcohol que mantenían pacientes alcohólicos (Wiers y cols., 2011) y que su utilización en combinación con terapia cognitivo conductual mejoró la tasa de recaídas de estos pacientes. Este no es más que un primer paso que indica cómo la perspectiva del *embodiment* puede servir para enriquecer las intervenciones mediante la inclusión de elementos corporales en la terapia psicológica. Investigaciones futuras podrán estudiar si la manipulación de movimientos corporales asociados con aproximación o rechazo puede mejorar la eficacia de tratamientos cuyo componente principal sea la exposición. Además, estos resultados pueden servir para que se estudie la eficacia de las

intervenciones ya existentes que incluyen el cuerpo como un elemento fundamental en la terapia.

En nuestra opinión, la mayor aportación que el *embodiment* puede hacer en el ámbito de la psicología clínica es la de haber recuperado el papel del cuerpo en los procesos psicológicos. El cuerpo no es únicamente la herramienta primaria que las personas utilizamos en nuestra interacción con el entorno, sino también una fuente de información y el sustrato en el que se originan los procesos cognitivos y emocionales más abstractos. Teniendo en cuenta la estrecha relación que existe entre estados corporales y estados emocionales y el vínculo que se ha sugerido entre estados corporales y sesgos cognitivos, parece sensato el incorporar el cuerpo a la práctica clínica, ya que se podría utilizar como una vía ascendente de intervención sobre los procesos psicológicos disfuncionales, que fuese complementaria a las más frecuentemente usadas vías descendentes emanadas de la psicología cognitiva. La inclusión de un nivel de intervención somático como un elemento común a todas las enfoques puede ser, en nuestra opinión, uno de los principales retos a los que se enfrente la psicología en las próximas décadas.

Study 1: Connections between embodiment and clinical psychology

Abstract

Within the present work, we will introduce the concept of *embodied cognition*, an approach that considers the role of the body in cognitive processing. General findings of this approach and particularly those studies that could have intersections or implications for applied clinical psychology will be reviewed. We will also focus on models which either have included the body as a significant factor in their explanation of psychological disorders or have been directly inspired by the embodied cognition account. Moreover, we will introduce some psychological interventions that include the body as a significant part of the therapy. This empirical work includes three experiments aimed to examine the role of the body on mood regulation processes that will be described and discussed. Finally, we draw some conclusions and assess the implications which these experiments and, more generally, embodied cognition may have for clinical psychology.

1. - Basic concepts

1.1. Embodied Cognition

Traditional cognitive models (e.g., Chomsky, 1984; Fodor, 1983) suggest that cognition is computation on amodal symbols in a modular system that is independent from perceptual, proprioceptive and behavior modules. Contrary to this view, the embodied cognition approach proposes that modal information - as for example bodily states, physical position, movements…etc. - are underlying cognition (Barsalou, 1999; 2008). The following example will illustrate the notion of embodiment. As an experience occurs (e.g. lying in bed), the brain receives multimodal information (i.e., perceptual, proprioceptive and motor) and integrates it as a whole representation stored in our memory (e.g., what the bed looks like, how my back feels when I lie on it, the movements required for lying down). Then, when knowledge (e.g., a bed) has to be retrieved from our memory, multimodal representations are reactivated to simulate how the brain represented this category. In this theory, the body is not just a tool that we have to express symptoms or our mental or physical state, but it is also an inherent part of our knowledge and our thinking. The kinesthetic-tactile experiences and its regularities constitute the core of our self-concept and are in the base of high order cognition (Gibbs, 2006). Thus, bodily states can modify cognitive states and also cognitive states can affect specific bodily functions (Barsalou, Niedenthal, Barbey, & Ruppert, 2003; Smith, 2005).

1.2. - Mirror Neurons

Findings in cognitive neuroscience strongly support the postulates of embodied cognition. In their research with nonhuman primates, Rizzolatti, Fadiga, Gallese, and Fogassi (1996) found a mechanism that accounts both for action and action's intention understanding. This mechanism, baptized as *mirror neurons*, revealed that the same neural substrates are employed when actions are perceived as when actions are performed. Further research demonstrated that the activity of mirror neurons reflects the perceived action's meaning rather than the mere visual description of motor actions (e.g., Kohler et al., 2002; Umiltà et al., 2001). Studies using sophisticated techniques of neuroimage, such as fMRI (e.g., Iacoboni et al., 1999), and also studies recording the activity of single neurons (Mukamel, Ekstrom, Kaplan, Iacoboni, & Fried, 2010) have reported the existence of an analogous mechanism in the human brain, and more specifically, in the motor cortex (for a review, see Rizzolatti & Craighero, 2004). Thus, it seems that the motor cortex may play a crucial role in complex cognitive abilities, such as the understanding of the intentions and goals of actions (Gallese, 2010). These findings are crucial for understanding the notion of simulation, one of the key concepts of the embodied approach.

1.3. - Simulation

Barsalou's (1999) theory of Perceptual Symbol Systems (PSS) assumes that a single, multimodal representation system in the brain supports diverse forms of simulation across different cognitive processes, including high level perception, implicit memory, working memory, long-term memory, and conceptual knowledge. Barsalou suggests that abstract cognitive processes imply the reenactment of multimodal memories (i.e., perceptual, sensory and motor). This reenactment, which differs across

the different cognitive processes, both in the mechanisms re-enacted and in the degree of activation of these mechanisms (Barsalou, 2008), is defined as simulation (see Barsalou, 2009, and Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005 for further information about simulation and simulators).

Similarly, Gallese (2010) proposes a common underlying functional mechanism - embodied simulation - which mediates the human capacity to share the meaning of actions, intentions, feelings, and emotions with others. The embodied simulation model challenges the notion that interpersonal understanding mainly lies on attributing other people's beliefs and desires, and assumes that intercorporeality is the main source of knowledge about the other people. According to this model, humans reuse motor processes in order to directly understand other people's actions, and emotion-related processes to understand other people's emotions. The same cortical circuits at work when we act, sense or feel emotions are re-enacted when we witness other people's actions, senses or emotions, though, these circuits neither completely overlap, nor show the same activation intensity in both cases.

In accordance with both proposals, Gallese and Lakoff (2005) affirm that sensorimotor simulations are involved in the elaboration and comprehension of abstract concepts, and these simulations are often metaphorical.

The concept of simulation and the findings concerning the mirror neurons' circuitry give basis for reconsidering perceptual, sensory and motor information as constitutive of higher order cognitive processes. A similar idea is proposed by Antonio Damasio (1994). In his work, Damasio affirms that the process of thinking consists of the ability to internally represent and organize mental images. These images have an origin in the primary sensory cortex areas, an idea that supports the notion that multi-modal representation underlies abstract cognitive processes. Evidence for an implication

of motor processes and bodily states in abstract cognitive processes, such as, for example, language comprehension, retrieval of information from memory, emotional recognition or attitude development, has been provided in studies originating from different research fields. Some of these studies are keystones in the embodied cognition theory, and some of them are especially relevant from a clinical point of view. In the following section we will describe these studies, with a special emphasis on those particularly relevant for clinicians.

2. - Empirical studies relevant for embodied cognition.

The number of studies concerning embodied cognition has increased enormously during the last decade. Their variety makes it possible to sum the studies up using different strategies, such as, for example, organizing them according to the area of knowledge (e.g., social psychology, social neuroscience, cognitive psychology, psycholinguistic), according to the cognitive processes they seem to affect (e.g., memory, persuasion, preference, emotional processing, emotional recognition) or according to the effectors that are sometimes manipulated, sometimes measured as output variables (e.g., arm movements, head movements, facial gestures, body postures).

As one of the aims of the present work is to bridge the embodied approach and the clinical field, we will try to give an overview of the general results that support the embodied cognition account, with a special emphasis on those studies that could be particularly relevant for psychological disorders. Our summary of the results is neither exhaustive nor complete, for extension but also for practical reasons. Yet, we expect that this introduction suffices to provide a general overview of the 'state of the art' in embodied cognition. Whenever possible, we will indicate reviews on the included topics that may help the reader to complete the information included here.

2.1. - Roots of embodiment in the classical literature.

The interest in the relationship between body and higher order processes is not recent. In "The expression of emotion in man and animal" (1872), Charles Darwin defined attitude as "a collection of motor behaviors that reflect an organism's evaluation

of an object". In his article "What is an Emotion?" (James, 1884) and in his posterior book "Principles of psychology" (James, 1890), the American psychologist William James defended the idea that emotions are subsequent to bodily changes "*bodily changes follow directly the perception of the exciting fact, and our feeling of the same changes as they occur* IS *the emotion*" (James, 1890, p. 449; italics and upper letters in the original). The stereotypical coordinated contraction of facial muscles and its relationship with emotion was already being studied in the XIX century. Guillaume Duchenne (1862) combined the electrical stimulation of facial muscles and the incipient technique of photography to show how the contraction of certain facial muscles determined the expressions of anger, fear, joy or sadness. More recently, Robert Zajonc (1980) commented on the non-cognitive nature of affect and preferences. In his work, Zajonc stresses the importance of the ties existing between the affective and the motor systems. For example, he wrote that "affect is not always transformed into semantic content but is instead often encoded in, for example, visceral or muscular symbols" (Zajonc, 1980, p. 158). In an experimental study, Zajonc and Markus (1982) argued that motor expressions of the affective response (visceral, physiological and facial) might also influence evaluative processes.

2.2. - Facial gestures and their relation to emotion.

Facial mimicry and gestures are probably one of the topics with longer tradition and more intensively researched looking for the influences of body on higher order processes. The almost universally shared links existing between facial gestures and emotions (e.g., Ekman, Levenson, & Friesen, 1983; Levenson, Ekman, Heider, & Friesen, 1992) , and the ability that human beings have to recognize other's internal

states from their facial expressions, has made facial gestures one of the major pathways for studying the relation between sensorimotor processes and other cognitive and emotional processes. The relationship between facial muscles contraction and emotional expression was first studied in the XIX century by Duchenne (1862). Since then, many researchers have been interested in the relation between facial mimicry and other cognitive and emotional processes. For a review of the classical relevant studies about the facial feedback hypothesis, see Adelmann and Zajonc (1989).

Research on this field put forward a controversy between those authors who proposed a cognitive, self-monitoring mechanism that underlies the influence of facial feedback on emotional experience (e.g. Laird, 1974) and those holding that cognitive mediation is not necessary for the facial feedback effect to occur and that physiological mechanisms (i.e., facial expression) may be sufficient to generate affective reactions, even when participants are not aware of them (e.g., Tomkins, 1962). One of the seminal studies that clarified this question was conducted by Strack, Martin and Stepper (1988). In this classical study, authors manipulated participants' facial expressions with a methodology that avoided a cognitive interpretation of the facial action and measured how this manipulation affected participants' judgments. Specifically, they asked participants to rate how funny they perceive a set of cartoons while either holding a pen with their lips only (a gesture that inhibited muscles involved in smiling), or with their teeth only (a gesture that activated muscles involved in smiling). In accordance with the authors' hypothesis, subjects who held the pen with their lips perceived the cartoons as less funny than subjects who held it with their teeth. These results showed that even when facial muscular activity is subtly manipulated, it may affect participants' judgments.

More studies along this line corroborated and extended these results (e.g., Larsen, Kasimatis, & Frey, 1992; Soussignan, 2002). Using the same manipulation, Havas, Glenberg and Rink (2007) found that facial mimicry affected language comprehension. In their experiments, participants were presented sentences with either pleasant or unpleasant content. Participants understood the sentences more quickly when their facial expression was congruent with the content of the sentence. Duclos et al. (1989) observed that manipulating the activation of facial muscles related to sadness, fear, disgust or anger led participants to report an increase of the specific emotion (in comparison with other emotions). Similar results have also been specifically reported for anger (see Berkowitz & Harmon-Jones, 2004). Niedenthal, Winkielman, Mondillon, and Vermeulen (2009) found that instead of being a side effect of being presented emotional information, facial mimicry plays a causal role in the processing of emotional concepts. When certain facial muscles were inhibited, participants showed less accuracy relating concepts to an emotion that engages those muscles. Analogously, Oberman, Winkielman and Ramachandran (2007) found that blocking facial muscles involved in mimicry impairs recognition of emotions that engage those muscles. Duclos and Laird (2001) reported that suppressing facial emotional expression influenced participants' emotional intensity and complementary, Niedenthal, Brauer, Halberstadt and Innes-Ker (2004) found that the internal emotional states of participants affected their ability to detect changes in emotional faces.

Of particular importance from a clinician point of view are the results of the study by Teasdale and Bancroft (1977). In this study the authors employed an electromyogram (EMG) to compare corrugator activity during happy and unhappy thoughts in a small sample of depressed participants. Unhappy thoughts increased both corrugator activity and depressed mood, and most importantly, corrugator activity was

highly related to depressed mood. Another important study from a clinician point of view was recently carried out by Kraft and Pressman (2012). In their study, participants were divided into three groups. While performing a stressful task, participants were asked to hold chopsticks in their mouths in a way that either a neutral face, a standard smile or a Duchenne smile were induced. The authors found that smiling may influence physical state. Participants who held chopsticks in a Duchenne smile or a standard smile reported a smaller decrease in positive affect than participants who held neutral facial expressions after recovery from the stressful activities.

Perceptual and memory processes also seem to be affected by the activation of facial muscles. In a recent study, Susskind, Lee, Cusi, Feiman, Grabski and Anderson (2008) found that adopting a facial gesture of fear or disgust momentarily affected the sensory capacity of participants. In their study, participants were asked to either adopt a facial gesture of fear, disgust or a neutral one. While performing a facial gesture of fear, participants increased their nasal inspiratory capacity, speeded their saccadic movements and increased their visual field, whereas while performing a facial gesture of disgust, the nasal inspiratory capacity, saccadic movements and visual field were affected in an opposite way. The authors concluded that facial expressions are not only signals of the related emotions, but they can also modify preparedness for perception and action. Continuing with the influence of facial gestures on memory processes, Riskind (1983) found that smiling facilitated the recall of pleasant autobiographical memories. Zajonc, Pietromonaco and Bargh (1982; see also Graziano, Smith, Tassinary, Sun, & Pilkington, 1996) presented their participants with pictures of facial expressions and instructed them to either a) imitate the expression of the picture b) chew some gum c) squeeze a ball with their hand or d) judge the faces. In a following recognition task, participants who imitated the facial expression showed the highest accuracy, whereas

participants who chewed gum (the most incongruent condition) showed the lowest accuracy. More recently, Topolinski (2012) found that inhibiting the motor component of word processing (i.e., by asking them to chew some gum) affected familiarity and implicit memory, but did not affect the recall of the presented words. In this study, the author performs a series of 7 experiments aimed to test whether different interference motor tasks (e.g., chewing gum vs. kneading a ball) have a different influence on implicit memory, familiarity or recognition. The author found that performing interfering oral motor tasks (in contrast to hand motor tasks), systematically influenced familiarity and implicit memory (preference for already presented stimuli vs. newly presented ones), whereas recollection indicators remained unaffected. The author found a memory effect that is rather unusual (usually the explicit and not the implicit memory is the more affected one), and of special interest for the present study, considering that such an effect has only been previously reported in individuals with brain injuries or dissociative syndrome, such as Capgras syndrome (Topolinski, 2012) . These results indicate that sensorimotor input may play a role in implicit, but not in explicit memory mechanisms.

In sum, facial gestures can modulate the emotional experience of individuals, facilitate the appearance of congruent memories and emotional states and also seem to affect memory and perceptual processes.

2.3. - Arm movements.

One of the pioneering studies that revealed an influence which the body has on cognitive processes was carried out by Cacioppo, Priester and Bernston (1993). In this study, participants were presented with Chinese ideographs while they performed either

an arm flexion or an arm extension. The authors showed that participants evaluated stimuli as more positive when they performed an approach reaction (i.e., pulling something toward the body) than when they performed an avoidance reaction (i.e., pushing something away from the body). In a complementary study, Chen and Bargh (1999) examined inverse way of influence. Specifically, the authors tested whether the evaluation of a stimulus influences the behavioral predisposition toward this stimulus and they expected that a positive evaluation of a stimulus would lead to approach tendencies, whereas a negative evaluation would lead to avoidance tendencies. Additionally, they expected an automatic activation of these tendencies (i.e., without explicit stimulus evaluation). Results support both hypotheses. In Experiment 1, participants had to evaluate words as positive or negative in meaning by pushing a lever forward (away from the body) or pulling a lever backward (towards their body). Results show that participants' RTs were faster when they have to push the lever in response to the negative stimuli (congruent condition) than in response to the positive stimuli (incongruent condition), whereas they responded faster when they pulled the lever in response to the positive stimulus (congruent condition) than in response to the negative stimulus (incongruent condition). In order to examine whether these behavioral predispositions were automatically activated, in Experiment 2 participants did not evaluate word valence. Specifically, participants always pushed (pulled) the lever as fast as possible when a word was presented. The result was the same as in Experiment 1.

Other researchers have extended these results (e.g., Cretenet & Dru, 2008; Dru & Cretenet, 2004; 2005; Förster & Strack, 1997; 1998; Friedman & Foster, 2000; 2002; Maxwell & Davidson, 2007). Although some authors have discussed the automaticity of the link between affective evaluation and motor behavior (e.g., Rottevel & Phaf, 2004) or the direct association between actions and attitudinal effects (e.g., Centerbar & Clore,

2006), most results are in line with the notion that arm movements can influence evaluative processes and vice versa (for a review see, for example, Centerbar & Clore, 2006; Maxwell & Davidson, 2007 or Phing, Dhillon, & Beilock, 2009). The study of Phing et al., (2009) for example, suggests that motor difficulty influences preference judgments. In their study, participants were presented with two identical objects that only varied in their orientation. One object was easy to grasp and the other hard to grasp. Results showed that participants were more likely to select an easy to grasp object when they were asked for the object they liked more, but not when they were asked for the object they disliked more. The authors concluded that we make preference judgments on a daily basis which are intimately tied to the motor system. Preference, as well as perception, seems to be grounded in action.

Additional evidence of the influence of arm movements on cognition comes from the field of psycholinguistics. In a seminal study by Glenberg and Kaschak (2002), participants had to evaluate the sensibility of presented sentences by releasing a button and pressing one of two buttons located either closer to the body or farther away from the body. In some critical trials, the sentences included actions that involved movements towards or away from the body. The authors found that responses were faster when the action described in the sentence was congruent with the action that participants had to perform in response to the sentence than when the action was incongruent. This congruency effect has been named as the Action-sentence Compatibility Effect (ACE). Other researchers extended these results by observing that this effect emerges in dependence of the attention devoted to the action described in the sentence (Taylor & Zwaan, 2008), that actions involving rotation are better understood when participants have to rotate their hand in the same direction (Zwaan & Taylor, 2006), that lexical decisions to words denoting arm or leg actions are facilitated when arm or leg areas in

the left hemisphere are stimulated with transcranial magnetic stimulation (Pulvermüller, Hauk, Nikolin, & Ilmoniemi, 2005) or complementarily, that motor areas are activated in the brain when participants listened to action-related sentences (Tettamanti et al., 2005). Thus, the ACE effect seems to be a very robust phenomenon (Zwaan, van der Stoep, Guadalupe, & Bouwmeester, 2012).

Particularly relevant for the present work is the study conducted by Wiers, Eberl, Rinck, Becker and Lindenmeyer (2011). In order to modify the approach action tendencies of alcoholic patients towards alcohol, the authors included a module of Cognitive Bias Modification (CBM; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002) before the cognitive-behavioural treatment. Specifically, participants were randomly assigned to one of two experimental or one of two control conditions. Patients in the experimental conditions were trained to consistently make avoidance movements (i.e., pushing a joystick) in response to alcohol pictures and approach movements (i.e., pulling a joystick) in response to pictures of nonalcoholic drinks. The two experimental conditions varied only as to whether participants were explicitly trained to avoid alcohol pictures or not. Patients in the control conditions were either not trained to avoid alcohol at all or received sham training. The authors found that the experimental manipulation of action tendencies has an effect on alcohol approach tendencies, that is, patients in the experimental condition changed from a small approach bias to a strong avoidance bias for alcohol. Moreover, when they evaluated participants one year later, relapse rates within the experimental group (46%) were lower than within the control group (59%). This result suggests that this minimal intervention seemed to improve treatment outcome one year later and is a clear example of how involving motor processes in therapy can help to improve therapeutic outcomes

(for a discussion on implicit processes in therapy see Kazdin and Blase, 2011; see also Shalev and Bargh, 2011).

2.4. - Embodiment research involving overt head movements.

A seminal study on this field was carried out by Wells and Petty (1980). In this study, the authors tested whether head movements influenced the attitude towards presented information. Specifically, they asked participants to perform either vertical (covert head nodding) or horizontal (covert head shaking) movements of the head whilst listening to a simulated radio broadcast. Regardless of whether or not the broadcast content was in accordance with participants' attitudes, participants agreed with the content more in the nodding condition than in the shaking condition. They also found that the content (attitudinal or counterattitudinal) interfered with the head movements, that is, incongruent head movements (i.e., head nodding when counterattitudinal and head shaking when attitudinal content was presented) were more difficult to perform than congruent head movements.

Further research on the role played by overt head movements in persuasion have been carried out by Briñol and Petty (2003). These authors observed that when participants listened to strong arguments supporting a policy, they were more likely to agree with the policy if they performed nodding instead of shaking head movements. On the contrary, when the arguments presented were weak, shaking head movements increased the likelihood of them agreeing with the policy. These results show that overt head movements affected the confidence of participants on their own thoughts.

Tom, Peterson, Lau, Burton and Cook (1991) observed that head movements can also influence participants' preferences. The authors masked their study as a test for

a new pair of headphones that had been developed for use whilst practicing different sports. Consequently, participants were told to move their heads up and down, as if they were running, or to shake their heads left to right as if they were riding a bicycle. During the experiment, a pen was present on a table placed in front of the participants. After the experiment, participants were told that the company considered the possibility of giving a pen as a present with the purchase of the headphones. They asked participants to choose between the pen they had seen while performing the experiment or a new one never seen before. Two thirds of participants who nodded in the experiment did choose the presented pen, whereas two thirds of participants who shook their heads during the experiment preferred the new one. Forster and Strack (1996) found that overt head movements can also affect memory processes. In a series of three experiments, these authors observed that recall of positive concepts was facilitated when participants performed a congruent (i.e., nodding) rather than an incongruent (i.e., shaking) movement at encoding.

Of higher relevance for the present study are the results obtained by Rahona, Ruiz Fernandez, Rolke, Vazquez and Hervas (2013). This study showed that overt head movements may play a role in the regulation of mood state. In the study, participants were induced into a negative mood state and subsequently engaged in an attentional task that involved either vertical (nodding) or horizontal (shaking) head movements. The results showed that head movements moderate the influence of depressive mood on emotional regulation. Head movements affected the ability of participants with high BDI scores to regulate their mood recovering their positive mood state, whereas they did not affect participants with low BDI scores. Specifically, participants with higher scores on BDI who nodded regulated as well as those with low BDI scores, whereas

participants with high BDI scores who shook their heads showed a diminished ability to regulate their mood states.

2.5. - Body postures and body locomotion.

Several studies on postural embodiment, following the terminology of Niedenthal et al. (2005), have found links between motor behavior and cognitive and emotional processes. One of the first studies that addressed the question of whether body posture may have an influence on other cognitive processes was carried out by Riskind and Gotay (1982). They found that body posture influenced participants' mood reports as well as it affected task performance. In their study, participants who were in a slumped posture were more likely to abandon a task earlier when they were successful, whereas participants who maintained an upright posture were more likely to abandon the task earlier when they were unsuccessful. Thus, when the posture was congruent with the outcome, participants tended to keep performing the task for a longer time. Following this line, Wilson and Pepper (2004) found that maintaining an upright posture facilitates the access to positive thoughts in comparison to maintaining a slumped posture.

In their second experiment, Duclos et al. (1989) tested the influence of postures on self reported emotions. In their experiment, participants were asked to adopt postures of fear, anger or sadness. Afterwards they had to report how much they felt of each of eight different emotions. The results show that adopting an emotional posture led them to feel the emotion they were expressing. Flack, Laird and Cavallaro (1999) replicated and extended these results. In particular, they asked participants to adopt facial expressions, body postures, or both simultaneously, that evoked anger, sadness, fear or

happiness. They found that the bodily and the facial expression of certain emotions increased the feeling of that specific emotion, and the emotions elicited by the combination of facial expression and posture were, in general, more intense than those elicited by either of the two alone. Analogously, adopting a posture incongruent with the information presented, reduce the neural emotional response (e.g., Harmon Jones & Peterson, 2009). The influence of bodily states in emotional states seems to be particularly true for those individuals who are more responsive to personal than to situational cues (Duclos & Laird, 2001). Studies on Interoceptive Awareness (IA) have explored more deeply the question of how the sensitivity of participants to their internal states can be related to different disorders and personality traits (e.g., Herbert & Pollatos, 2012). Several studies have provided evidence which suggests that IA is crucial for the intensity of emotional experience (e.g., Barrett, Quigley, Bliss-Moreau, & Aronson, 2004; Herbert, Herbert, & Pollatos, 2011; Herbert, Pollatos and Schandry, 2007; Wiens, 2005). And more importantly for the present work, some authors have suggested that deficits in the ability to be aware of one's internal states could be related to personality traits such as alexitimia (e.g., Herbert et al., 2011; Herbert & Pollatos, 2012) or psychological disorders such as eating disorders (e.g. Pollatos et al., 2008; Herbert & Pollatos, 2012).

An important study addressed the question of how body movements, and particularly coordinated body movements between patient and therapist, may influence therapy outcomes (Ramseyer & Tschacher, 2011). In this study, the authors adopted a neutral concept of movement coordination, focusing on the occurrence of coordinated dynamics and not on the appearance of specific gestures, postures or other movements. They recorded and digitized 104 psychotherapy sessions of 70 different dyads and performed a motion energy analysis on this sample. According to their results,

movement synchrony is found at a level above chance in psychotherapeutic interactions. Moreover, this nonverbal synchrony was found to be linked to personal characteristics in the domain of interpersonal behavior. Specifically, therapist pacing was predominantly related to patient's self efficacy, whereas therapist leading was associated with better patient's relationship rating. These results indicate that the psychological relationship, as well as the inner states of interacting persons, is reflected in their bodies, which play an important role in the development and maintenance of relationships.

Convergent evidence comes from studies that examined how inhibition of body movements affected both internal states and social interaction. For example, a study by Butler et al. (2003) tested the personal and social consequences of suppressing emotional expressions during a conversation. Dyads of participants consisting of a regulator and a partner were assigned to either suppression or control conditions. Regulators in the suppression condition were instructed not to express their emotions whereas in the control condition they received no instructions. Compared to the control condition, expression suppression increased regulators' distraction during conversation, regulators' and partners' blood pressure, and decreased partners' feelings of rapport and willingness to develop a future friendship. These results indicate that suppressing expressive behavior affect not only the internal experience during a conversation, but also the likelihood of developing new social relationships.

Further evidence of the influence of bodily states in higher order processes comes from studies which observed or manipulated gait patterns or body locomotion. For example, Michalak, Troje, Fischer, Vollmar, and Schulte (2009) carried out a study to examine whether clinically depressed individuals (Experiment 1) or sad induced individuals (Experiment 2) presented different gait patterns than never depressed

individuals or happy induced participants, respectively. Five features were found to be significantly different between depressed (sad induced) and never-depressed (happy induced) participants: speed, arm swing, lateral body sway, posture of the upper body and vertical up-down movements of the upper body, with a similar pattern of results in both experiments. Reduced velocity, vertical movements and arm swing, as well as an increase of slumped posture and stronger lateral body sway, characterizes depressed and sad gait patterns. These differences are attenuated with therapy (Michalak, Troje, & Heidenreich, 2010) and reciprocally, inducing participants to adopt sad or depressed gait patterns, affected memory processes. Compared to participants who adopted a "happy" gait pattern, those who were induced to adopt a "sad" gait pattern presented a more negative bias in a self-reference encoding task (Rohde, Troje, & Michalak, 2012). Gait direction also affects information processing. An interesting study by Koch, Holland, Hengstler and van Knippenberg (2009) observed that stepping backwards enhanced cognitive performance in a stroop task, compared to stepping forwards or sideways.

In sum, studies on postural embodiment have found that body postures may affect emotional states, but also motivational, perceptual and memory processes (e.g., Niedenthal et al., 2005). The influence of body postures on emotional states seems to be reciprocal and is modulated by the responsiveness of participants to internal cues (e.g., Duclos & Laird, 2001). Moreover, body movements may also affect therapy (Ramseyer & Tschacher, 2011), as well as social competences (e.g., Butler et al., 2003), and also seemto be affected by therapy (Michalak, Troje, & Heidenreich, 2010).

2.6. - Conceptual metaphor and embodied representation of concepts.

The last source of evidence of the influence of body on cognitive processes that we are going to mention in the present work refers to those studies that could be framed as conceptual metaphor studies. Conceptual metaphor is a term coined by Lakoff and Johnson (1980; 1999) and refers to the idea that abstract concepts are based on physical metaphors. Accordingly, metaphors are not only useful, but necessary to develop abstract thoughts, because they allow people to link abstract concepts (e.g., affect or time) to sensory experiences. These links are crucial for the development of abstract thought and for understanding other people. Without such links, concepts would lack reference to the physical world, and it would be impossible to share them with others.

Part of these studies has focused on the association between abstract concepts and basic spatial dimensions (i.e., left-right, front-back, and up-down). For example, it has been found that numbers are represented along a mental number line that goes from left to right, with small numbers represented on the left and big numbers on the right (Dehaene, Bossini, & Giraux, 1993; for a review see Fias & Fischer, 2005). This representation affects manual (e.g., Dehaene et al. 1993; Zorzi, Priftis, & Umiltà, 2002) verbal (e.g., Brysbaert, 1995) and oculomotor responses (e.g., Fischer, Warlop, Hill, & Fias, 2004; Ruiz Fernández, Rahona, Hervas, Vazquez, & Ulrich, 2011) and supports the idea that abstract concepts are grounded in concrete, spatial dimensions. In western cultures, concepts like time are also represented along a left to right spatial dimension (e.g., Boroditsky, 2000, Santiago, Lupiañez, Perez, & Funes, 2007), but they are also represented in a back to front spatial dimension, with the past at the back and the future at the front (e.g., Torralbo, Santiago, & Lupiañez, 2006). Some studies have also examined the metaphorical representation of affect in terms of space (see Crawford, 2009, for a review). Studies by Wapner, Werner and Krus (1957), Meier and Robinson (2004) or Crawford, Margolies, Drake and Murphy (2006) have documented an

association of positive affect with upper regions of the physical space and negative affect with lower regions of the physical space. Among these studies, one of special relevance for the present work was carried out by Meier and Robinson (2006). In this study, the authors examined whether depressive symptoms were associated with shifts of attention towards lower regions of the visual space. The authors found that those participants who reported higher levels of depressive symptoms presented an attentional bias towards lower regions of the visual space.

Apart from the studies that found an association between abstract concepts and spatial positions, there are many other studies providing evidence for an embodied representation of concepts, or at least providing evidence that some metaphors that are common in our language and involve physical sensations could actually be grounded in our bodies (for reviews see Gibbs, 2006; Isanski & West, 2010; Landau, Meier & Keefer, 2010; Meier et al., 2012). For example, some studies explored the commonly used metaphor that equals kindness or friendliness with warmth and social isolation or rudeness with coldness. In a study by Zhong and Leonardelli (2008), participants who were excluded from participating in a ball game tended to choose hot beverages after the game more so than the participants who played an active role in the game did. In another experiment, participants who were asked to recall their own experiences of social rejection perceived the room temperature as significantly colder than those induced to recall experiences of social inclusion. Complementarily, inducing physical sensations of warmth improved reports of participants' perceived emotional relationship with friends and relatives (Ijzerman & Semin, 2009), and it led to target individuals being perceived as more friendly (Williams & Bargh, 2008). Other authors explored the metaphor which associates the importance of an argument with its heaviness (Jostman, Lakens & Schubert, 2009), the common association between brightness and goodness

(Meier, Robinson & Clore, 2004), or the experimental induction of feelings of elevation (e.g., watching inspirational positive videos) and feelings of warmth in the chest or being lifted (Schnall et al., 2010).

Of special interest for the link between basic and clinical fields are the studies which explored the embodiment of morality or purity into experiences of physical cleanliness (see Schnall, 2011). In this line, it has been found that hand cleaning behaviors attenuate the guilt induced by one's moral transgressions (Zhong & Liljenquist, 2006). Some studies have reported that priming cleanliness can sometimes soften the judgment of others' misdeeds (Schnall, Benton, & Harvey, 2008) and sometimes makes moral judgments become harsher (Zhong, Strejcek & Sivanathan, 2010). A recent study by Lee & Schwarz (2010) found that the desire for cleanliness was related to the part of the body which actually committed the moral transgression. In their experiment, participants were asked to either perform an unethical or an ethical act by leaving a voice message or by sending an e-mail. Afterwards participants were asked to report how much they were willing to pay for some products. Hand sanitizer and mouthwash were included in the list of products. Participants who performed an oral (written) unethical act gave a higher value to the mouthwash (hand sanitizer) than participants who performed a written (oral) unethical act. These findings suggest that moral purity is embodied and is specific to some motor modalities involved in moral transgression. More authors have followed this line of research and found similar results (e.g. Gollwitzer & Melzer, 2012). It is possible that although the desire for cleanliness evolved in a specific social evolutionary context, just like disgust evolved as a food-specific emotion and achieved moral connotations (Schnall, 2001), a genuine desire for cleanliness and tidiness can go beyond the moral domain. Thus, for instance, Lee & Schwarz (2010) have found that cleanliness reduces the cognitive dissonance that is

associated with having made a difficult decision. Similarly, it is likely that there is a link between these particular embodied cognitions and some psychological disorders. One firm candidate is obsessive-compulsive disorder (OCD). A common feature of this disorder is that patients become worried about cleanliness and also moral purity (e.g., obsessive ideas of having committed involuntary moral mistakes or sins or unbearable feelings of physical or moral disgust) (e.g., Foa et al., 1995). Interestingly, there is preliminary evidence showing a deep connection between disgust and morality. For instance, Schnall, Haidt, Clore, and Jordan (2008) experimentally induced physical disgust by spraying an unpleasant odor, or by asking participants to use a dirty and messy desk. Participants exposed to disgust subsequently made more harsh moral judgments. This result has also been confirmed in similar studies (e.g., Horberg, Oveis, Keltner, Cohen, 2009; Inbar, Pizarro, Knobe & Bloom, 2009). Furthermore, an opposite relation (i.e., between purity and condescendence in moral judgments) has also been reported in experimental studies (Schnall, Benton, & Harvey, 2008; Helzer & Pizarro, 2011). These embodied representations can open some interesting avenues in the study of obsessive ideation.

3. - Psychological and psychopathological models that give a role to the body

3.1. - Multilevel models of emotion

The common feature of models reviewed in this section is that all are based on the premise that emotional information can be processed on different levels. A distinction that is common to all multilevel models is the proposal of a "schematic" system and a "propositional" system. The role of the body in these models is twofold; on the one hand it is basically conceived as an output or response system that implements reactions elicited by other systems. On the other hand, it is supposed to have automatic links with the perceptual system (corresponding with the concept of primary emotion proposed by Damasio, 1994) and be able to activate whole schemas.

3.1.1. - Dual memory model (Philippot, Baeyens, Douilliez, & Francart, 2004).

The dual memory model is an attempt to integrate all previous multilevel models (Leventhal, 1984; Power & Dalgleish, 1997; 2008; Smith & Kirby, 2000; Teasdale & Barnard, 1993). It proposes the existence of five different interactive systems that play a role in cognition and emotion, and in the cognitive regulation of emotion. The five systems proposed by the model are the perceptual, body response, schematic, object recognition and propositional system:

a) The perceptual system analyzes and integrates raw sensory input from each perceptual modality and has innate and automatic connections to the body response system.

b) The body response system performs body responses, such as facial expression, body postures and movements, as well as the whole range of visceral responses. These body responses are fundamental to emotion.

c) The schematic system, as its name suggests, is based on schemata. A schema is an implicit representation, automatically built by abstracting communalities in the similar experiences lived by an individual, which integrates sensory, perceptual, semantic and motor information of these experiences.

d) The object recognition system allows for the construction of discrete mental representations, which are the main input of the propositional system.

e) The propositional system consists of declarative knowledge, and constitutes the basis for labeling emotions, communicating emotions, and for willful problem solving and coping in emotional situations.

In the description of the processes operating on the schematic and propositional systems, authors suggest that the activation of any facet of a schema has the potential to activate the whole representation. A schema can activate body response systems and conversely, bodily states can trigger a related schema or activate concepts at an unconscious level that later on may have priming effects on the processing of information.

According to this model, schemata are central for emotion and the regulation of emotion is mostly a question of modulation of the schema. Three mechanisms regulate the activation of the schemata: the elaboration of emotional information, the redirection of attention, and the regulation of peripheral feedback.

3.1.2. - Interacting Cognitive Subsystems (ICS, Teasdale & Barnard, 1993).

In this model, the authors propose the existence of interacting subsystems that are specialized in the processing of certain types of information. These subsystems are organized, from more concrete to more abstract, into a hierarchical semantic model.

With regard to the sensory model, the acoustic subsystem encodes information relative to sound, the visual subsystem encodes visual information and the body state subsystem encodes dimensions of internal sensory input, such as bodily sensations of pressure or pain, positions of parts of the body, as well as tastes and smells.

At the intermediate level, the morphonolexical subsystem encodes the structural description of entities and relationships of sound space, whereas the object subsystem encodes the structural description of entities and relationships of visual space.

At the meaning level, the propositional subsystem integrates the information of morphonolexical and visual subsystems into descriptive knowledge, whereas the implicational subsystem integrates both sensory/perceptual information with propositional knowledge, and the mental entities created from the regularities in the world and the body can be seen as schematic models of experience.

Finally, this model proposes an effector level, with three subsystems, the articulatory, the limb and the somatic and visceral subsystems, that implements the output of the subsystems at the intermediate and meaning level.

Of significant relevance for the present work is the fact that this model proposes that body states and body feedback directly influence cognition at the implicational level, which consists of schemata, concepts, values, norms and other implicit knowledge that is not necessarily verbal and which is considered to guide our behavior.

3.1.3. - SPAARS (Power & Dalgleish, 1997; 2008).

In a similar way to other multilevel models of emotion, the SPAARS (Schematic, Propositional, Analogical, and Associative Representation Systems) model (Power & Dalgleish, 1997, pp. 415) addresses the role of cognition in emotion and proclaims the existence of four interactive systems hierarchically organized:

a) The analogical representation system: at this level, the initial processing of sensory and motor information takes place. The representations from this system are the input of the other three ones (i.e., the associative, the propositional and the schematic) that operate in parallel.

b) The associative system comprises of the innate and learned associations between these representations, and it is described as a connectionist, direct, and automatic system.

c) The propositional system is similar to those proposed in other models and its main characteristic is to be language-like.

d) Finally, the highest level is called the schematic system, which is implicational, stores information in a flexible manner, and generates emotion through the process of appraisal (evaluations of events that cause specific reactions).

According to this model, both the associative and the schematic system can elicit emotions and emotional disorders are constructed from the five basic emotions (i.e., fear, sadness, anger, disgust, and happiness). The simultaneous coexistence of two or more emotions (coupling), conflicts between emotions, or an interlocking of different representation systems can lead to an emotional disorder.

The authors suggest that treatments may take into account the pathway through which a given emotional disorder arose in order to enhance their effectiveness.

3.2. - Phenomenological approaches

Merleau-Ponty (1966) stated that the body is a “natural subject” and the basis of our existence. From a phenomenological perspective, Fuchs & Schlimme (2009) consider that embodiment is on its way to becoming a major paradigm in psychopathology. They define embodiment as “not only the embedding of cognitive processes in brain circuitry but also to the origin of these processes in an organism’s sensory-motor experience in relation to its environment”. These authors distinguish between subject body and object body. Subject body does not require explicit attention but is the medium and background of our experience and interaction with the environment. Basic body feelings are bodily experiences and ways of experiencing the world. It applies in particular to existential feelings, such as feeling at home, sense of belonging, sense of reality and so forth. According to these authors, disturbances of embodiment may be classified in two types: those affecting the subject body or the body schema, as depression or schizophrenia, and those affecting the object body or the body image, such as somatoform disorders or eating disorders.

3.3. - Lindeman and Abramson model

Recently, Lindeman and Abramson (2008) have proposed a theoretical model describing the causal mechanisms that link cognitive and somatic elements of depression. Specifically, the authors summarize recent findings in embodied cognition,

suggesting that hopelessness is metaphorically conceptualized as motor incapacity and when the mental simulation of this mental incapacity is reenacted, it leads to the appearance of peripheral physiological effects, such as psychomotor retardation and low energy.

In their revision of the literature, these authors found that imagining physical movements leads to the activation of the same areas of the brain that are active while motor planning and execution (see Jeannerod & Frak, 1999, for a review). Complementary, imaging movement suppression reduces the corticospinal excitability and attenuate twitching of the thumb induced by transcranial magnetic stimulation (Sohn, Dang & Hallet, 2003). Moreover, neurological studies of depression give support to the notion that motor incapacity simulation may lead to psychomotor retardation. In concrete, the behavioural approach system (BAS) has been found to be associated with regions of the brain related to planning and execution of motor movements (Depue & Iacono, 1989). Therefore, a simulation of motor incapacity may inhibit the function of the BAS, leading to a deficit in approach motivation that is observed in depressed patients. Moreover, depressed individuals show slowed performance in mental rotation of objects (Rogers et al. 2002) and weaker finger force in response to TMS of the motor cortex (Oathes & Ray, 2006); results that could be both explained by arguing the simulation of a motor incapacity. Based on these results, Lindeman & Abramson (2008) conclude that imagining a lack of movement or inability to move may drastically reduce motor activity, creating a subjective experience of motor incapacity.

The model proposed by the authors posits that some emotions may result as a consequence of the simulation of the bodily experiences in which the abstract meaning of a situation is metaphorically conceptualized (e.g., feel oppressed as a result of perceived social pressure), and that the peripheral physiological concomitants of these

emotions derive from these simulated sensorimotor experiences. When applied to depression, the metaphor simulation model suggests that incapacity to avoid negative outcomes or bring about positive events is metaphorically conceptualized as motor incapacity and the simulation of this mental incapacity becomes an integral component of hopelessness, leading to subjective feelings of lethargy and immobility and to objective physiological outcomes, such as low energy and retardation. The consequence of reenacting the motor incapacity experience is feeling down, trapped or paralyzed and simultaneously experiencing psychomotor symptoms. This model is also coherent with the notion that being depressed means feeling “down” or “low”. Specifically, the simulation of a motor inability to rise in the vertical space may be at the basis of these feelings. Congruent with this notion are the results from Meier & Robinson (2006), who found that participants with a higher level of depression symptoms showed a bias towards information presented at the bottom of the screen and also with results from Riskind and Gotay (1982), who found that participants in a slumped posture persisted less in a subsequently learned helplessness task.

The model proposed by Lindeman & Abramson (2008) has important implications for clinical practice. On the one hand, central and peripheral activity could be considered as metaphorical, conceptual simulation of cognitions. This fact opens up new ways of identifying non-adaptive schemata, and suggests complementary ways of intervention less mediated by abstract cognitive processes (see Kazdin & Blase, 2011; Shalev & Bargh, 2011). On the other hand, it implies that real or imagined bodily experiences of motor capacity may be useful to alleviate depressive symptoms. Consistent with this later implication, it has been found that exercise (that can be considered as an experience of motor capacity) can reduce hopelessness (Hembree, 2001), as well as negative cognitions associated with depression (Lash, 2000).

Moreover, exercises that imply a higher level of perceived motor capacity, such as martial arts, are found to increase positive affect and self efficacy in comparison to other forms of exercise, such as riding a stationary bike (Bodin & Martinsen, 2004).

More effective interventions may thus involve the development of strong cues indicating motor capacity. Based on the perspective proposed by Barsalou (1999), the recall of sensory memories, rather than the mental imagery of successful motor acts, could be a more effective way of developing these cues.

3.4. - Synergetics

The synergetics account was initially proposed by Haken (1977) in the field of non-equilibrium physics. Recently, Haken and Tschacher have transferred some of its principles in order to provide a theoretical model which is able to account for intentional behavior and neural dynamics (Haken & Tschacher, 2010) brain activity (Haken, 1996) or cognitive functioning and human behavior (Haken & Tschacher, 2011). Specifically, they consider that behavior is one field in which organizing patterns arise spontaneously and they therefore apply the synergetics account to its explanation. According to their model, the environment, including body postures and states, constrains the possible amount of psychological states of a given individual and behavior can be seen as a function of changes in the personal space (cognitive and emotional variables of a person), which is affected by the environmental space. Important for this model is the idea that for the spontaneous emergence of organized patterns, those patterns cannot be prewired in a system, but they emerge when the same mechanisms are used by a system to perceive and to categorize events (in other words, cognition must be modal in order to solve the problem of intentionality in intelligent behavior). According to the

synergetics model, embodiment variables must be considered as control parameters of cognition.

4. - Psychological interventions that involve the body in therapy

4.1. - Body Oriented Psychotherapy

Body Psychotherapy is considered as a mainstream branch of psychotherapy. The term is commonly used as a compendium of methods and techniques whose common denominator is that the body plays a significant role in the psychotherapeutic practice. Accordingly, it could be defined as "a holistic perspective within the therapeutic intervention strategy, explicitly working with body-oriented, nonverbal techniques" (Röhrich, 2009, p. 139). Under the umbrella of the label "Body Psychotherapy", many different approaches and therapeutic interventions are collected. Although the terminological diversification and the differentiation in numerous schools is sometimes hard to justify, particularly considering the closeness of some theoretical concepts and therapeutic practices, methods and techniques could be generally divided into two main groups: On the one hand, those techniques and approaches aimed to modify behavior or to provide more insight to the client (e.g., Dance Movement Therapy, Bioenergetic Analysis, Feldenkreis), on the other hand those techniques and approaches whose main goal is physical relaxation and homeostasis (e.g., Functional relaxation, Hakomi).

In the following lines we will describe two examples of techniques and interventions that could be included in the general category of Body Psychotherapy.

4.1.1. - Dance Movement Therapy

According to the British Association of Dance Movement Therapy, "Dance Movement Therapy is the psychotherapeutic use of movement and dance through which

a person can engage creatively in a process to further their emotional, cognitive, physical and social integration. It is founded on the principle that movement reflects an individual's patterns of thinking and feeling".

Dance is an art which is performed as a form of emotional expression, social interaction, and which is both involved in some sacred or seduction rituals in many different cultures worldwide. It is not known when dancing became a part of human culture, but some of the most ancient archeological vestiges of human civilizations (e.g., Bhimbetka rock shelters) show traces of the practice of dance in prehistoric times. Some of the benefits of dance include physical fitness, coordination, arts appreciation, improved rhythmic expression, confidence and improvement of social outlook (e.g., Alpert, 2011). Dance therapy is based on the notion that the body and the mind work together and evolved from the belief that dancing is a path of the expression of an individual's innermost feelings, which allows the individual to become aware of feelings through sensations and movements.

The evidence for the effectiveness of most Body Psychotherapies is actually very scarce. Only a relatively small number of evidence-based studies support the effectiveness of DMT for psychiatric patients with depression amongst other diagnoses. Ritter and Low (1996) elaborated a meta-analysis to review quantitative research on DMT and estimate the effect of DMT across studies. The authors concluded that DMT is an effective treatment for patients suffering from different symptoms and especially effective for the treatment of anxiety. The effect sizes were, in general, small to moderate and the authors suggested that studies including control groups and more reliable measures were necessary in this area. Some studies tried to overcome these methodological shortcomings. For example, Jeong, Hong, Lee, Park, Kim, and Suh (2005) evaluated psychological health and observed the changes in neuro-hormones of

twenty adolescents with mild depression who were treated during 12 weeks with DMT, compared to a control group. After 12 weeks in the DMT group, all indicators of psychological distress significantly decreased and plasma neurotransmitter concentration varied. Specifically, participants in the DMT group showed a higher concentration of serotonin in plasma and a lower dopamine concentration than control participants did. More efforts have been devoted recently to provide DMT with the necessary background of evidence-based studies, including a systematic review on the effects of DMT and dance on psychological outcomes performed by Strassel, Cherkin, Steuten, Sherman, and Vrijhoef (2011), and a recent meta-analysis ellaborated by Koch, Kunz, Lykou, and Cruz (2013), in which moderate effects of DMT were found for quality of life and clinical outcomes as well as small effects were noted for well-being, mood, affect, and body image.

4.1.2. - Functional relaxation

Functional Relaxation (FR) is a therapy based on enhancing body awareness, which is usually applied in a group-therapy setting and was initially developed by the physiotherapist Marianne Fuchs (1994). This technique involves directing the attention to breathing while exploring the smooth micromovements of the head, the hip, the chest, the neck and the shoulders that are involved in breathing, especially while expiring. The rationale of the technique is that traumatic experiences, as well as the maintenance of high stress levels, can alter an individual's autonomic rhythms. As a result, the individual develops permanent muscular tension in different regions of the body that can finally become pathological. The frequent practice of this technique results in enhanced body awareness, which in turn helps to identify areas of the body

that are supporting tension, and to an earlier detection of bodily needs. In line with the idea of homeostasis and self-regulation, FR is not supposed to consciously influence autonomic rhythms. In contrast, the enhanced ability to identify bodily needs that the individual learns during the training phase facilitates autonomous respiration changes according to the actual physical needs of the body. Some studies have reported the efficacy of this intervention for physical disorders with important psychogenic emotional factors, such as tension headaches (Loew, Sohn, Martus, Tritt, & Rechlin, 2000), irritable bowel syndrome (e.g., Lahman et al., 2010), or acute asthma (Lahman et al. 2009, Loew et al., 2001; Loew, Siegfried, Martus, Tritt, & Hahn, 1996). In contrast, there are practically no studies that explore the efficacy of this type of intervention in psychological disorders. A plausible reason for this lack of evidence is the fact that many multi-component structured psychotherapy protocols for the treatment of anxiety, emotional and somatoform disorders already include respiration exercises or other relaxation techniques (e.g., Edmund Jacobson's progressive relaxation) that most probably contribute to the efficacy of these protocols but whose efficacy in isolation is still rather unknown.

4.2. - Mindfulness

In simple terms, mindfulness is the act of deliberately focusing one's attention on the present moment, trying not to make any judgments but just to acknowledge/accept thoughts, feelings or bodily sensations that arise in the attentional field. It is a state of consciousness that allows people to be aware of present (mental and bodily) experiences without judging them (note that there are several definitions of mindfulness; e.g., Kabat-Zinn, 1994, p. 4; Marlatt & Kristeller, 1999, p. 68). In

mindfulness, breathing is used to anchor our attention. As breathing occurs automatically, we can focus our attention on the body by simply observing our breathing without trying to control it. As breathing is something we do all the time, observing it allows us to come into the present moment. Breathing can also be focused upon during a daily life activity (e.g., focusing awareness on breathing whilst walking, listening to music, hanging out the laundry, waiting at red traffic lights, etc.). During such daily life routines, one can also focus on sensorimotor aspects of the body (e.g., noticing how strong you are grasping the glass when you are drinking, noticing how taut your leg muscles are whilst walking). In body scan exercises, the focus of attention is moved around the body, observing the bodily sensations and becoming aware of them. The regular practice of body scan allows us to become more aware of bodily sensations and thus to integrate this awareness in daily life activities.

Over the last decades, mindfulness has gained more and more popularity as an intervention tool. Although mindfulness can be used as an autonomous intervention, many psychological approaches have included mindfulness practices to enrich their own methods or are even based on mindfulness (Baer, 2003; Germer, Siegel, & Fulton, 2005). One of the interventions that uses mindfulness is Mindfulness-based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002) which focuses on the prevention of a depressive relapse for people suffering recurrent episodes of depression (Bondolfi et al., 2010; Kuyken et al., 2008; Ma & Teasdale, 2004; Godfrin & van Heeringen, 2010; Piet & Hougaard, 2011; Teasdale et al., 2000). Besides the cognitive-behavioral elements of the therapy, MCBT also uses mindfulness techniques that include the body in order to interrupt automatic cognitive processes that can trigger a new depressive episode (Burg & Michalak, 2011, see also Felder, Dimidjian, & Segal, 2012; Hofmann, Sawyer, & Fang, 2010). The efficacy of MBCT has been shown to be comparable to the

continuation of the medication with antidepressants (e.g., Kuyken et al., 2009; Barnhofer et al., 2009; Teasdale et al., 2000). Additionally, MBCT has been shown to have positive effects on anxiety disorders, such as panic disorder (e.g., Kim et al., 2009, Kabat-Zinn, et al., 1992), social anxiety disorder (e.g., Kocovski, Segal, & Battista, 2009; Koszycki, Benger, Shlik, & Bradwejn, 2007) and generalized anxiety disorder (e.g., Craigie, Rees, Marsh, & Nathan, 2008; Evans et al., 2008). Another psychological intervention that uses mindfulness is Mindfulness-Based Stress Reduction (MBSR), established in 1979 by Jon Kabat-Zinn. MBSR focuses on stress reduction to improve physical and emotional well-being in a variety of diseases and disorders. Recent literature suggests that MBSR is effective in enhancing quality of life and physical well-being, and that it is also effective for a broad range of disorders. Specifically, MBSR-Training enhances the ability to cope with stress in everyday situations, but also in more serious stress disorders (Carroll, Lange, Liehr, Raines, & Marcus, 2008; Chang, 2004), addiction (Altner, 2002), anxiety disorders (Miller, Fletcher, & Kabat-Zinn, 1995) and also physical disorders (e.g., cancer see Carlson, 2004; Carlson, 2005; chronic pain see Kabat-Zinn, 1982; for a meta analysis of MBSR and health benefits see also Grossmann, Niemann, Schmidt, & Walach, 2004).

4.3. - Psychodrama

Psychodrama is an intervention approach developed by Jacob Levy Moreno (1946), whose main objective is for patients to gain insight into their lives, facilitating their personal growth. Psychodrama could be employed in non-clinical as well as clinical contexts. A person trained in this method (i.e., Psychodrama Director) guides the client's dramatic action in order to explore the environments they live in through

these actions. Clients re-enact past real-life situations in the present, using techniques such as role-play, mirroring or sociodrama. These re-enactments are sometimes a reproduction of a real situation and sometimes the projection of how the situation was perceived by the *protagonist* (the principal actor). This technique uses the body in action as a way of recreating situations that are problematic for the client, giving them the opportunity to change their perspectives in order to better evaluate their behavior, to enhance or work at a specific stage of the motion and to recall the feelings and sensations evoked, and thereby more deeply understand a particular situation in their lives.

As it occurs with other body oriented interventions, empirical data on the effectiveness of psychodrama is quite infrequent. Most of the information published on this topic is case illustrations, clinical or anecdotal experiences or information which has often been based on methodologically weak experimental designs. Empirical research, however, is considerably harder to find (Kipper & Ritchie, 2003). Despite the relatively small amount of controlled studies aimed at examining the efficiency of Psychodrama as a therapeutic intervention, the literature reviews performed during the last 30 years (D'Amato & Dean, 1988; Kellermann, 1982; Kipper, 1978; Kipper & Hundal, 2003; Rawlingson, 2000), and specially the meta-analysis performed by Kipper and Ritchie (2003), suggest that the overall effect size of most common psychodramatic interventions (i.e., role reversal and doubling) is similar and in some cases better than those reported by other group psychotherapy interventions. In particular, the overall treatment effect size found for the 25 studies included in the meta-analysis was .95, which could be considered as a large effect (Cohen, 1992). This result implies that psychodramatic techniques can be adopted in order to enrich other forms of group psychotherapy. As is the case with other body oriented psychotherapies (e.g.,

sensorimotor therapy), some authors recommend the use of psychodramatic techniques for the treatment of traumatic experiences (Kipper, 1998) based on the explanation proposed by Van der Kolk, McFarlane and Weisaeth (1996), for the difficulties of recounting traumatic experiences. According to these authors, an exposure to a terrifying experience freezes the normal biochemical, physical, perceptual, cognitive, emotional, psychological and behavioral processes, leaving the sensorimotor memory unprocessed. These experiences are registered primarily at the sensorimotor level and have never been properly coded at the intellectual memory. They are stuck at the sensorimotor level and therefore methods of treatment that address sensorimotor memories, such as psychodrama, could be employed to retrieve the painful memories at the level they have been previously stored (Kipper, 1998).

4.4. - Sensorimotor psychotherapy

Sensorimotor psychotherapy is an intervention model developed by Pat Ogden and her collaborators (Ogden, Minton, & Pain, 2006) for the treatment of patients with post-traumatic stress disorder (PTSD; Ogden & Minton, 2000; Van der Kolk, McFarlane, & Weisaeth, 1996). In comparison to other psychological interventions, the sensorimotor psychotherapy stresses the importance of intervening at the somatic level, because the underlying bodily sensations that are active during cognitive processing constitute a biased substrate that influences individual functioning, as well as processes related to decision making and especially those concerning the self, and when the altered sensorimotor patterns are firmly established, it is difficult for cognitive interventions to modify the reactions associated with high physiological activation. Among other skills, sensorimotor therapists are supposed to be able to scan and read the

body movements and other physical signals of changes in their patients' autonomous activation or bodily sensations, and to verbally reflect these variations in the same way that they reflect the cognitions or emotional states of the patient. During the treatment of traumatized individuals, it is important to work with their defensive reactions in order to restore a flexible and adaptive functioning. Traumatized individuals have experienced how their defensive reactions were unsuccessful in guaranteeing their safety. During the traumatic experience, individuals are forced to interrupt active defensive reactions associated with movement and instead adopt immobilizing defensive reactions, paralyzing themselves. However, active defenses are still present in traumatized individuals, and can be rediscovered and revitalized by paying attention to their bodies, restoring their feeling of power and capacity. It is essential for the sensorimotor therapy to identify and resolve the sequence of defensive reactions that contribute to the maintenance of symptoms. During the therapy process, through observing what the body wants to do whenever the trauma is recalled, the possibility of a different response emerges. This response, incipient in the moment of trauma, is revitalized and develops into a more flexible and adaptive response to the present moment. It is important that the therapist is able to identify those actions that are incomplete or not expressed, in order to help patients to complete these potential actions, facilitating the development of new capacities.

Sensorimotor psychotherapy is an intervention model which consists of three phases. The first phase of the treatment is aimed at identifying somatic reactions linked to physiological hyper-activation or hypo-activation, and at exploring existing somatic resources and developing new ones that help to maintain the physiological activation inside the tolerance window. During the second phase of the treatment, the traumatic situations are recalled and these somatic resources are implemented. The objectives of

this phase are, on the one hand, to reduce the patients' avoidance and phobic reactions to the traumatic memories and, on the other hand, to explore and enact hidden tendencies of action and to implement the somatic resources that help to regulate the autonomous physiological responses produced by inadequate defensive reactions. The third phase is aimed at normalizing the daily functioning of the patient in those areas that could have been affected during the course of the disorder, using the strategies and knowledge developed during the two previous phases.

Sensorimotor therapy shares its structure and objectives with other psychological interventions (e.g., Cloitre, Koenen, Cohen & Han, 2002; Herman, 1992). The main contribution of this model is the inclusion of somatic interventions at the same level as emotional or cognitive ones, equaling the importance of the ascendant and descendent intervention paths. By including the body as a primary way of intervention in the reprocessing of trauma, therapists are able to directly act upon the sensations and the movements, influencing patients' symptoms and facilitating changes in cognitions, emotions, beliefs and relational capabilities of the patients.

5. - Conclusions

The repercussion of embodied cognition on scientific research and the interest of authors of different fields on this topic have increased exponentially in the last ten years, especially in cognitive neuroscience, social neuroscience, cognitive psychology, social psychology, and developmental psychology, but also in robotics, cognitive ecology, psycholinguistics and cognitive linguistics (Barsalou, 2010). The embodied cognition account has revealed the enthusiasm of some researchers, up to a point that some authors have proposed that embodiment may be the appropriate framework for

unifying psychological science (Schubert & Semin, 2009), as well as the skepticism of some others (e.g., Adams, 2011).

In our opinion, and according to all the evidence summarized in this overview, we consider that embodiment may actually enrich the knowledge we have about psychological processes. Concepts, ideas and experimental results of embodiment have had an impact on modern psychology. One of the most important outcomes derived from embodiment is that more researchers have directed their attention to the influence of bodily states on abstract cognitive and emotional processes. The role of the body has been restituted, and the importance and influence of sensorimotor processes and bodily states in cognition and emotion is increasingly attracting research. Some previously mentioned results can have potential implications, both theoretical and applied, but indeed, more research focusing on the influence of bodily states in mental processes involved in or partially responsible for psychological disorders is needed. We believe that there is a lack of studies addressing this question, and therefore revealing influences of bodily states in psychological processes related to mental disorders can be of interest for both experimental and clinical psychologist. For the former, this could form an interesting and highly unexplored field of research, for the later, this could increase the motivation of these psychologists to include the body in therapy, and to develop bottom-to-top intervention strategies complementary to the most employed top-to-bottom, which could eventually improve the outcomes of psychotherapy. Moreover, it could help to bridge both disciplines, making results from experimental psychology more directly applicable for clinicians. Although it may be theoretically plausible to propose that bodily states can influence the course of a certain disorder, evidence of this influence on psychological processes crucial for the disorder is essential in maintaining this hypothesis. Therefore, the aim of the present study is to test whether some of the

motor processes that are reported in the revised literature as influencing cognitive or affective processes, may have an influence on psychological processes considered to be involved in the maintenance of disorders.

We therefore looked for a psychological process that combines at least three important characteristics. First of all, as our interest is to link embodiment and clinical psychology, the target process, or a dysfunction on it, must have been transdiagnostically related in the literature with the onset or maintenance of one or more psychological disorders. Secondly, as a prerequisite of this dissertation is that the contribution to the field must be novel and original, the influence of bodily states on the target process has to date scarcely been explored. Finally, as there are several psychological processes that could fulfill the two previous requisites, we took into account the previous experience of our research group on the study of the target process and the advantage of providing a step forward in an existing line of research. Thus, for the aim of the present study and considering these three pre-requisites, we considered that mood regulation was a suitable target process, as it is a perfect intersection between the ultimate function of emotions (Koole, 2009) and a diversity of implicit and explicit operational modes (Gyurak, Gross, & Etkin, 2011). Thus, in the next sections of the present work, general information concerning mood regulation will be provided. In addition, three experiments, conducted to experimentally explore the influence of bodily states on mood regulation, will be reported.

Study 2.1: Overt head movements moderate the effect of depressive symptoms on mood regulation

Abstract

There is increasing evidence that a dysfunction in the regulation of negative mood states plays a significant role in the onset and maintenance of depression. Research has found that levels of depression are associated with the intensity of mood regulation deficit. The present study aimed to explore the role which the body plays in mood regulation processes. More specifically, we studied whether head movements could have an influence on mood regulation in dysphoric states. Participants were induced into a sad mood and then performed a mood regulation task in which they were presented with a set of positive pictures immediately after performing either vertical (i.e., nodding) or lateral (i.e., shaking) head movements. We considered changes in mood before and after the experimental task as an index of the effectiveness of mood regulation. As expected, the results showed that higher levels of dysphoria were associated with greater difficulty in regulating the participants' mood. More importantly, this association was present in participants who shook their heads, but not in those who nodded. The implications these results have for the study of mood regulation processes and for the understanding and treatment of psychological disorders are discussed.

Key Words: Embodiment, mood regulation, head movements, moderation, sad mood induction, dysphoria.

According to Thompson's classical definition, "emotion regulation consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reactions, especially their intensive and temporal features" (Thompson, 1994, pages 27-28). This regulation may imply the activation of emotional, cognitive or behavioral strategies (Hervas, 2011). Deficits in mood regulation characterize many different psychological disorders (Gross & Levenson, 1997). In particular, a dysfunction in the regulation of mood states may play a significant role in the onset of depression and contribute to the maintenance of depressive symptoms over time (Hervas & Vazquez, 2013). Using a longitudinal design, Beevers and Carver (2003) found that individuals who showed higher emotional persistence (i.e., slow recovery from a sad mood induction) were more likely to show an increase in depressive symptoms after a period of a few weeks. Other studies corroborate the relationship of deficits in mood regulation and depression. For example, Peeters, Nicolson, Delespaul, and deVries (2003), found that negative mood states associated with daily negative events lasted longer in depressed patients compared to non-depressed control group. In another study, Gilboa and Gotlib (1997) found that after a negative mood induction, formerly depressed individuals, who were not currently depressed, remained in a negative mood for longer than never depressed controls did. The level of dysphoria (i.e., depressive symptoms in non-clinical samples) also has an impact on the regulation of positive mood. In a laboratory study, McMakin, Santiago, and Shirk (2009) found that dysphoric participants have difficulties in maintaining positive emotional states in response to positive stimuli (i.e., positive emotion eliciting video clips) compared to nondysphoric controls. Research has also found that the

severity of depressive symptoms is associated with an inability to regulate mood states (e.g., Williams, Fernández-Berrocal, Extremera, Ramos, & Joiner, 2004), which suggests a reciprocal relationship between mood regulation and depression. On one hand, impairments in the ability to regulate mood are considered to be a vulnerability factor of depression and, on the other hand, the more severe the symptoms are, the less able individuals are to regulate their mood states.

There is ample evidence on the role of cognitive factors in these emotional regulation deficits in depression (see Joorman & D'Avanzato, 2010). Mood regulation difficulties have been found to be associated with low self-esteem (Heimpel, Wood, Marshall & Brown, 2002), rumination (Joorman, 2010), or even attentional strategies (Sanchez, Joormann, Marker, LeMoult, and Vazquez, 2013) in depressed participants. Yet, the contributions of bodily factors to regulatory processes have received much less attention in the literature despite the fact that the notion that body states, postures and gestures can influence psychological processes is nothing new. William James (1890) was the first psychologist to suggest that body states precede higher order processes, such as affective ones. More recently, the embodiment approach has renewed the interest of researchers, inspiring them to analyze influences of the body on cognitive (e.g., Bargh, Chen, & Burrows, 1996; Jostmann, Lakens, & Schubert, 2009), social (e.g., Briñol & Petty, 2003; Meier, Schnall, Schwarz, & Bargh, 2012) and affective processes (e.g., Niedenthal, 2007).

Following this new embodiment literature, there is emerging evidence concerning the role of body signals on altered emotional states. A recent study by Kraft and Pressman (2012) has found that facial gestures can influence physical and psychological reactions to stress. In this study, participants were divided into three groups, two of them were asked to maintain a facial expression in which muscles

involved in smiling were active, whereas the third group was asked to maintain a neutral expression. Participants in the smiling groups showed lower heart rates during stress recovery and reported decreases in positive affect during the stressful task to a lesser extent than the neutral group. These results suggest that the activation of muscles related to facial expression moderate the impact of stress in terms of affective and physical reactions.

Other sets of studies have addressed the issue of whether gestures involving parts of the body other than the face are related to attitudes towards presented material (e.g., Briñol & Petty, 2003; Cacioppo, Priester, & Berntson, 1993; Tom, Pettersen, Lau, Burton, & Cook, 1991; Wells & Petty, 1980). For example, in a classic study, Tom et al. (1991) found that different head movements associated with approach or avoidance (i.e., nodding and shaking) influenced participants' attitudes when making decisions or showing preferences during the task. Recent research has replicated and extended these findings with refined methodologies and through different manipulations (e.g., Briñol & Petty, 2007; Niedenthal, Barsalou, Ric & Krauth-Gruber, 2005) which allows us to conclude that "some forms of motor biases or their sensory consequences can subtly influence a person's attitude" (Cacioppo et al.,1993, p.15).

From a theoretical point of view, Interacting Cognitive Subsystem (ICS) theory proposed by Teasdale & Barnard (1993) is a useful point of reference when considering the existing data. This theory emphasizes the importance of considering a multi-level model for adequately accounting for affective reactions (see also Philippot, Baeyens, Douilliez, & Francart, 2004; Power & Dalgleish, 1997; 2008). The ICS model specifically proposes that body states can directly affect the emotional experience without the mediation of verbal/propositional codes. This direct body-emotion pathway

has been advocated by these authors to account for a non-cognitive pathway to depression maintenance.

Unfortunately, despite the interest of these theoretical considerations, empirical studies supporting this hypothesis (i.e., a direct influence of body signals in maladaptive psychological processes) are very scarce. We can find an exception in some classical studies. Riskind and his colleagues explored whether the posture (i.e., upright or slumped) affected participants' emotional persistence (Riskind & Gotay, 1982) and their emotional reactions after negative feedback (Riskind, 1984). Duclos et al. (1989) explored whether facial gestures and bodily postures associated with anger, sadness or disgust affected participants' emotional experience. The results of these studies confirmed the idea that bodily postures may have an impact on affective outcomes.

Thus, based on prior research that showed that body movements can influence attitudes and emotional reactions, it is plausible to hypothesize that the body can also affect emotion-related processes with important implications for clinical disorders. Thus, the aim of the present study is to test whether body movements that are reported in the literature as somatic components of emotions (see Tom et al., 1991) may actively affect mood regulation. The approach of this research is relevant because it could open up new avenues in the treatment of emotional disorders.

More specifically, in the present study we explore whether head movements, that have been shown to affect participants' emotions in previous research, can modulate the influence of dysphoria on how efficiently participants regulate their mood after a sad mood induction. After a sad mood induction participants are assigned to one of two experimental conditions. In one condition, participants perform vertical head movements (i.e., nodding); in the other condition they perform lateral head movements (i.e., shaking). We measure dysphoria and anxiety levels at the beginning of the

experiment and the mood state prior to the mood induction, after the mood induction and after the experimental task.

According to current literature, we first hypothesize that after the sad mood induction, participants with higher levels of dysphoria would show poorer mood regulation than participants with lower levels of dysphoria. Our second hypothesis is that performing nodding-like head movements accompanying the appearance of regulation-facilitating visual stimuli (i.e., positive emotional images) will help participants to recover from their sad mood state more than performing shaking-like head movements.

Method

Participants

42 undergraduate students (24% men, *M* = 21.4 years) participated in this 20-min experiment and received course credits for their participation. All participants reported to be right handed and to have normal hearing and normal or corrected-to-normal vision.

Stimuli and apparatus

For the sad mood induction a 9-minute sad music piece (i.e., Prokofiev's Russia under the Mongolian Yoke played at half speed) and three negative scenes (see Hervas & Vazquez, 2013) were used. A similar procedure has proved to be effective in inducing sad mood states (Clark & Teasdale, 1985; Hervas & Vazquez, 2013).

A sample of 25 pictures[1] with positive valence (*M* = 7.4) and medium arousal (*M* = 4.9) were selected from the International Affective Picture System database

[1] The 25 IAPS images used in the present study were 1440, 1463, 1540, 1720, 1810, 1811, 2030, 2040, 2057, 2080, 2091, 2160, 2224, 2344, 2346, 2362, 2391, 4609, 4610, 4617, 4623, 4640, 5270, 5480, 5628, 5660, 5820, 5830, 5890, 5982, 7200, 7260, 7410, 7570 and 7580.

(IAPS; Lang, Bradley, & Cuthbert, 2008). Pictures were presented on a black background (0.23 cd/m^2) in the middle of a 15-inch computer screen.

Four visual references consisting of a green square (23 x 23 mm) in the middle of a yellow rectangle (38 x 51mm) were placed in the experimental room. Two of them were located in front of the participant; one situated at a height of 1.80 m and the other at a height of 0.8 m. The other two were placed to the left and right of the individual, at a height of approximately 1.2 m.

Measures. Measures of positive and depressive mood state (Mood state assessment; EVEA; Sanz, 2001), dysphoria (Beck Depression Inventory-II; BDI-II; Beck, Steer & Brown, 1996) and anxiety (Beck Anxiety Inventory; BAI; Beck, Epstein, Brown & Steer, 1988) were collected. In the present experiment the internal consistencies of the positive and depressive subscales of the EVEA, BDI-II, and BAI the, were α = .91, α = .88, α = .83, α = .93, respectively.

Procedure and design. The design of the experiment and the format of a standard experimental trial are presented in Figure 1. Initially, participants read and signed the consent form at the beginning of the experiment. Subsequently, participants were asked to complete an initial set of questionnaires, consisting of EVEA (Time 1), BDI-II and BAI. These measures were considered baseline measures. Once the first set of questionnaires was completed, participants were induced into a sad mood state. Immediately after the mood induction, participants completed a second EVEA (Time 2). Once the questionnaires were completed, participants were randomly assigned to one of the two experimental conditions. Participants in the nodding condition were asked on two occasions to look at the visual references placed up and down in front of them, alternating between the two, whenever a cross appeared on the computer screen. In contrast, participants in the shaking condition were asked on two occasions to look at

the visual references placed at their left and right, alternating between the two, whenever a cross appeared on the computer screen. In both conditions participants were told to just look at the pictures, once they appeared on the screen. The instructions given to participants did not allow them to guess the real purpose of the experiment. It was presented as a study aimed to examine how directing foveal attention to peripheral regions may influence memory processes. In order to avoid participants moving only their eyes, participants were told that to ensure foveal vision, it was necessary to move their heads, so their eyes could remain centered in their orbit thus maximizing foveal attention.

The experimental block consisted of 50 experimental trials. An experimental trial consisted of a blank screen (1,500 ms) which was followed by a fixation cross (4,000 ms), followed by one of the selected pictures (3,500 ms), and a blank screen (2,500 ms). Each one of the pictures appeared twice during the experimental block. At the end of the experimental block, participants were asked to complete a third EVEA (Time 3) questionnaire.

Finally, participants were fully debriefed and asked to guess the purpose of the experiment. None of them reported to be aware of the real aim of the study.

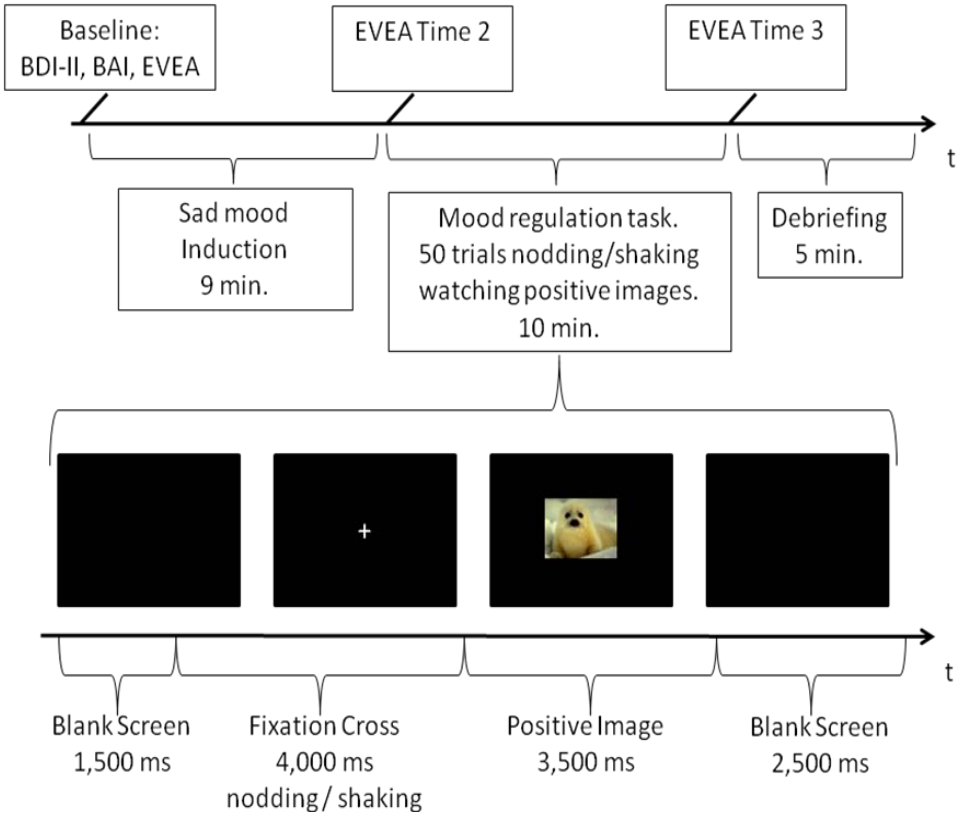


Figure 1. The figure shows a graphic description of the procedure (upper timeline) and of a standard experimental trial (lower timeline) in the mood regulation task. BDI-II: Beck Depression Inventory- II; BAI: Beck Anxiety Inventory; EVEA: Escala de Evaluación del Estado de Ánimo [Mood State Assessment Scale].

Statistical analyses.

All statistical analyses were performed using the software package SPSS 15.0 for Windows (SPSS Inc., Chicago, Illinois).

A series of t-tests were performed on baseline measures (BDI-II, BAI, positive, negative and total EVEA at Time 1) in order to ensure that both groups did not significantly differ in terms of the relevant variables at the beginning of the experiment. Similarly, a t-test comparing EVEA scores at Time 1 and Time 2 was performed, in order to test the effectiveness of the mood induction procedure.

Changes in the EVEA mood scores obtained after the mood induction procedure served as the main dependent variable. As variability among initial scores is a problem

common to many pre-post comparisons, we constructed residualized EVEA change scores using a simple linear regression model in which post-movement EVEA scores (Time 3) were predicted by post-induction EVEA scores (Time 2). This procedure allows the variability to be separated from the residuals from the EVEA scores in Time 2. A set of three different residuals (positive, depressive and total EVEA scores) were used as criteria in the subsequent regression analyses.

Subsequently, we centered (Holmbeck, 2002) the continuous predictor variable (i.e., dysphoria, as measured by BDI scores) and encoded the categorical variable (i.e., the experimental condition) as a dummy (0 = nodding; 1 = shaking) (Calvete, 2008; Frazier, Tix, & Barron, 2004). Then, following standard requirements for moderation analyses (e.g., Baron & Kenny, 1986), stepwise multiple regression was performed to test whether head movements moderate mood changes from Time 2 to Time 3, using residualized EVEA change scores as dependent variables (including centered dysphoria in the first step, type of movement in the second step, and their interaction in the third step).

Finally, we conducted tests of simple slopes by comparing at Time 3 the slopes of the regression line predicting changes in mood state from dysphoria levels for participants who nodded vs. participants who shook their head. These analyses and their correspondent graphs are recommended to better understand the interaction between variables in moderation analyses that include a categorical and a continuous variable (e.g., Frazier et al. 2004).

Results

Participants in the nodding experimental condition did not significantly differ at Time 1 from participants in the shaking experimental condition in any of the relevant variables (BDI-II, BAI, positive, negative and total EVEA, all p> .11).

The sad mood induction procedure produced a significant decrease in positive (M_{T1-T2} = -8.90, p<.001) and total mood (M_{T1-T2} = -16.57, p<.001), as well as a significant increase in depressive mood (M_{T1-T2} = 7.56, p<.001).

The results of the stepwise regression analyses are presented in Table 1.

Table 1 Stepwise regression analyses predicting changes in positive, negative and total mood state at T3.

		β	*t*	ΔR^2
Negative mood (T3)				
	Step 1			.10*
	Dysphoria	.32	2.10*	
	Step 2			.00
	Dysphoria	.31	2.04*	
	Movement	-.05	-.32	
	Step 3			.07†
	Dysphoria	.11	.59	
	Movement	-.04	-.29	
	Dysphoria*Movement	.33	1.78†	
Positive mood (T3)				
	Step 1			.01
	Dysphoria	-.11	-.68	
	Step 2			.01
	Dysphoria	-.12	-.73	
	Movement	-.10	-.62	
	Step 3			.13*
	Dysphoria	.16	.82	
	Movement	-.11	-.72	
	Dysphoria*Movement	-.45	-2.36*	
Total mood (T3)				
	Step 1			.10*
	Dysphoria	-.31	-2.05*	

Step 2			.00
Dysphoria	-.31	-2.02*	
Movement	-.002	-.01	
Step 3			.13*
Dysphoria	-.04	-.20	
Movement	-.01	-.08	
Dysphoria*Movement	-.45	-2.48*	

* $p < .05$; † $p < .10$

As can be seen in Table 1, dysphoria was a significant predictor of change in depressive and total mood, but not in positive mood. Type of movement was not associated with changes in mood state. Yet, most importantly, the interaction between dysphoria and the type of movement was the only significant predictor of changes in positive and total mood state, and was a marginally significant predictor of changes in depressive mood state. This result indicates that the type of movement performed moderated the influence of dysphoria levels on mood state changes, as can be seen in Figure 2.

Simple slope analyses (Aiken & West, 1991) clarified this moderation. Dysphoria was not a statistically significant predictor of changes in residual negative (β=.14, *p*=.54), positive (β=.17, *p*=.47), or total mood (β=-.04, *p*=.87) after the experimental task when participants nodded. Yet, dysphoria did predict changes in residual negative (β=.50, *p*=.02), positive (β=-.52, *p*=.02), and total mood (β=-.69, *p*<.001) when participants shook their heads. As expected, among participants who shook their heads, the severity of dysphoria was associated with a worsened mood after the mood regulation task. However, among participants who nodded their heads, the effect of dysphoria on the ability to regulate mood was not significant.

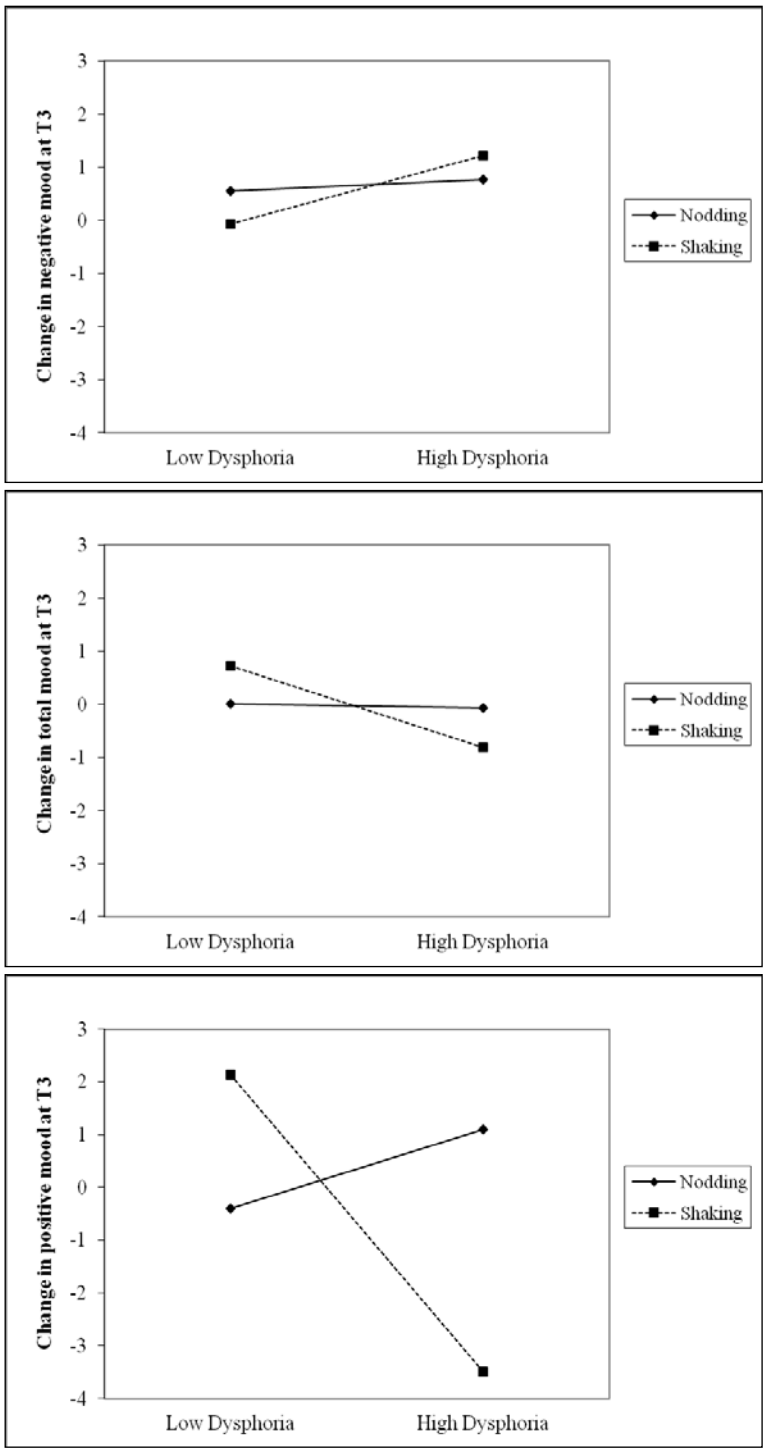


Figure 2. Interaction effects Dysphoria x Type of Movement when the change in negative (upper graph) positive (middle graph) and total mood (lower graph) between T2 and T3 is considered.

Discussion

The aim of the present work was to examine whether body movements may have an impact on mood regulation processes. Specifically, we examined whether overt head movements may moderate the relationship between dysphoria and mood regulation. In line with previous results, and confirming our first hypothesis, dysphoria severity was associated with difficulties in regulating mood after a sad mood induction. In general, participants with higher levels of dysphoria showed poorer mood regulation when exposed to a set of positive stimuli than participants with lower levels of dysphoria. More importantly, overt head movements moderated this relationship thus confirming our second hypothesis. Specifically, the association between levels of dysphoria and mood regulation deficit was only present among those participants who performed lateral head movements. The act of nodding the head seemed to counteract the effect of dysphoria, improving participants' ability to regulate mood.

Earlier research has found that facial gestures moderate the influence of stress in affective and physical reactions (Kraft & Pressman, 2012) and also that body postures and movements affect emotion reactions (e.g., Duclos et al., 1989; Riskind & Gotay, 1982). Our study expands these findings in two directions. First, it demonstrates that besides facial gestures, which are physiologically more directly linked to emotional neural circuitry, overt head movements affect mood regulation. This finding suggests that body movements, other than facial gestures, can influence the recovery from sad mood in dysphoric individuals, which could have important clinical implications. Secondly, the present study shows that the influence of body movements on emotional processes is not restricted to stress, but also to sad mood, extending implications eventually to the field of mood disorders.

Moreover, our results can help to explain, from a different perspective, some results found in previous studies. For example, previous research has reported that some

strategies which are efficiently used by non-depressed participants to regulate their mood, as recalling positive information when they are in a sad mood (Joorman, Siemer, & Gotlib, 2007) or watching a positive clip (McMakin et al., 2009), are not equally effective when used by individuals with high levels of depressive symptoms. There is not a clear explanation for this null effect of standard strategies of mood regulation in depressed individuals. In light of our results, a plausible hypothesis is that body movements, gestures or facial expressions present in the sample of dysphoric individuals might be incongruent with the mood-enhancing task, preventing its effectiveness.

The present results support the theoretical principles that guided ICS theory, since modifying body states affected the efficacy of mood regulation. Actually, ICS theory suggests that body signals directly affect the implicational level (i.e., schematic models of experience) in maintaining mood states. Specifically, this theory proposes that schematic models related to affect have to be continuously "regenerated" in order to maintain mood (Teasdale & Barnard, 1993, p. 100). Two interacting loops contribute to this continuous feeding of affect-related schematic models (Teasdale & Barnard, 1993, p. 127). The first one is a verbally loaded ruminative loop (Propositional → Implicational → Propositional); whereas the second one can be considered as a somatic loop (Body states → Implicational → Somatic-Visceral-Body effects → Body states). Thus, two different pathways can feed implicational meanings. Whereas much effort has been devoted to analyze and modify the influence of ruminative loops on the maintenance of negative schemata (e.g., Vanderhasselt & De Raedt, 2012), research aiming to test the somatic loop is much scarcer. The present study provides initial evidence of the influence of this somatic loop in dysphoric states. Future research

should assess more directly whether changes in body states may induce changes at the implicational level.

Finally, the present study gives further support to the embodiment approach and underscores its potential clinical implications (for a review see Rahona, Ruiz Fernández, Hervas, Rolke & Vazquez, 2013). Although levels of dysphoria were not as high as in clinical samples, our results suggest that positive movements could easily be employed as a successful coping strategy after a negative event in life. In this sense, if this line of research is extended to clinical population and consolidated, it could help to enrich therapeutic approaches, making them more comprehensive and effective (e.g., refractory cases) by involving therapy motor and corporal components aimed at modifying the information received through body channels.

Study 2.2: Effects of arm movements on mood regulation.

Abstract

Previous studies have found an influence of bodily states on higher order cognitive processes involved in psychological disorders. For example, an influence of facial gestures on the recovery of stressful tasks was reported in a recent study by Kraft & Pressman (2012). Rahona, Ruiz Fernández, Rolke, Vazquez and Hervas (2013) found that overt head movements can moderate the effect of dysphoria on mood regulation processes. The present study was carried out parallel to Study 2.1, and aimed to test whether the results obtained in Study 2.1 could be extended to other movements that have been associated with approach and avoidance. Specifically, the design of Rahona et al. (2013; Study 2.1) was replicated, in this occasion manipulating arm movements (i.e., arm flexion vs. arm extension) as the independent variable. The results obtained in the present study suggest that, contrary to our hypotheses, arm movements do not play a role in mood regulation. The absence of significant results and the implications of this are discussed.

Evidence of an effect of overt head movements on regulatory processes was found in Study 2.1. This result makes a new question arise regarding what kind of movements may have a similar effect on mood regulation. The literature on embodiment is rich in postures and gestures that may have an influence on high-order cognitive processes (e.g., Niedenthal, Barsalou, Winkielman, & Krauth-Gruber, 2005; see also Rahona, Ruiz Fernández, Hervas, Rolke & Vazquez, 2013). Among bodily postures with an influence on cognitive processes, probably one of the most studied is the bodily posture involving arm flexions and extensions. For example, in the study by Cacioppo, Priester and Bernston (1993), participants had to evaluate Chinese ideographs while pulling or pushing on a table. Under these conditions, participants evaluated stimuli as more positive when they pulled than when they pushed the table. These results are interpreted by the authors as an embodiment of approach and avoidance reactions. Whereas people are habituated to attract objects that they desire by flexing their arms, they are used to rejecting objects that are undesired by extending their arms. In the opinion of these authors, these arm movements are stored as motor components of approach/avoidance behaviors. In congruency with the results of Cacioppo et al., a complementary study by Chen and Bargh (1999) showed that the content of evaluated stimuli could facilitate or inhibit arm movements. Specifically, after watching positive stimuli, participants were faster at performing arm flexions than arm extensions, whereas the opposite was true when participants watched negative stimuli. Other researchers provided further information about the influence of arm movements on higher order cognitive processes (Centerbar & Clore, 2006; Cretenet & Dru, 2008; Dru & Cretenet, 2004; 2005; Förster & Strack, 1997; 1998; Friedman & Foster, 2000; 2002; Glenberg & Kaschak, 2002; Maxwell & Davidson, 2007; Rottevel & Phaf, 2004; Taylor & Zwaan, 2008; Zwaan, van der Stoep, Guadalupe, &

Bouwmeester, 2012) and, most importantly, arm movements have been successfully used in a program aimed at modifying psychological processes involved in disorders. To be specific, in the study carried out by Wiers, Eberl, Rinck, Becker and Lindenmeyer (2011), arm movements have been successfully employed as part of a module of Cognitive Bias Modification (CBM; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002), aiming to modify approach tendencies towards alcohol among alcoholic patients. In this study, participants were randomly assigned either to an experimental or a control condition. Patients in the experimental condition were trained to consistently push a joystick in response to alcohol pictures and pull a joystick in response to pictures of nonalcoholic drinks, whereas patients in the control conditions were either not trained to avoid alcohol at all or received sham training. Only the patients in the experimental condition showed a modified bias for alcohol, changing from a small approach bias to a strong avoidance bias for alcohol. Additionally, when those participants were evaluated one year later, the authors found that relapse rates among the experimental group were lower (46%) than among the control group (59%).

Therefore, we consider that arm movements could be an adequate candidate to continue testing the influence of bodily states in mood regulation. Specifically, we replicated the design of Study 2.1, but in this case, instead of overt head movements, participants were asked to either push (i.e., avoid condition) or pull (i.e., approach condition) on a lever placed to the right at the front of the experimental desk. Our hypotheses were identical to these formulated in Study 2.1. Specifically, we first hypothesized that after the sad mood induction, participants with higher levels of dysphoria would show poorer mood regulation than participants with lower levels of dysphoria. Our second hypothesis was that performing an arm flexion accompanying the appearance of regulation-facilitating visual stimuli (i.e., positive emotional images)

would help participants to recover from a sad mood state more effectively than when performing an arm extension.

Method

Participants. 40 students (35 women, 5 men) from the Complutense University of Madrid participated in this 20-min experiment and received course credits for their participation. On average participants were aged 22.3 years, and all of them were right handed and reported normal hearing and normal or corrected-to-normal vision.

Stimuli and apparatus. The stimuli used for the mood induction, as well as the sample of 25 IAPS pictures, were identical to those used in Study 2.1. A slider identical to the one used in the study by Ulrich, Eikmeier, de la Vega, Ruiz Fernández, Alex-Ruf, and Maienborn (2012) was used to allow participants to perform arm flexions or extensions.

Measures. Measures were identical to the ones used in Study 2.1.

Procedure and design. The procedure and design were identical to those used in Study 2.1, with the only exception of the instructions given to participants. Participants in the arm-flexion condition were asked to pull the lever towards them whenever a fixation cross appeared on the computer screen, and keep the lever at the endpoint of the slider until the presented picture disappeared. Participants in the arm-extension condition were asked to push the lever away from them whenever a fixation cross appeared on the computer screen, and keep the lever at the endpoint of the slider until the presented picture disappeared. Once the picture disappeared from the computer screen, participants in both conditions took the lever back to the middle point of the slider until the next fixation cross appeared.

*Statistical analyses.*The only difference between Studies 2.1 and 2.2 was the independent variable manipulated (i.e., arm movements instead overt head movements). Consequently, all statistical analyses performed on Study 2.2 were identical to those performed in Study 2.1.

Results

Participants in the arm flexion condition did not significantly differ at Time 1 from participants in the arm extension condition in any of the relevant variables (BDI-II, BAI, positive, negative and total EVEA, all p> .31).

The sad mood induction produced significant decreases in positive (M_{T1-T2} = -10.05, p<.001) and total mood (M_{T1-T2} = -20.27, p<.001) as well as significant increases in depressive mood (M_{T1-T2} = 10.22, p<.001).

Regression analyses revealed results that contrast with those obtained in Study 2.1. First of all, we could not confirm our first hypothesis, as the level of dysphoria did not significantly predict changes in depressive mood (β=.18, *p*=.26) and only marginally predicted significant changes in positive (β= -.28, *p*=.08) and total mood (β=.-29, *p*=.07). It may be possible, however, that this absence of significance was due to an interaction between Dysphoria and Type of movement. If this was the case, the level of dysphoria could be, for example, a significant predictor of mood changes among those individuals who performed arm extensions, but not among those who performed arm flexions. Moderation analyses on residualized mood changes were performed by introducing Dysphoria (i.e., BDI-II scores) as predictor in Step 1, Type of movement (i.e., arm extension=0, arm flexion = 1) as categorical predictor in Step 2, and Dysphoria x Type of movement as a predictor in Step 3. As can be observed in Table 2,

neither the Type of movement performed, nor the interaction Dysphoria x Type of movement, proved to be a significant predictor of changes in mood state. Thus, the second hypothesis, which proposed that arm movements may moderate the influence of dysphoric states on mood regulation, could not be confirmed.

Table 2. Stepwise multiple regression analyses predicting changes in positive, negative and total mood state at T3.

		β	*T*	ΔR^2
Negative mood (T3)				
	Step 1			.03
	Dysphoria	.18	1.16	
	Step 2			.04
	Dysphoria	.18	1.15	
	Movement	-.19	-1.21	
	Step 3			.00
	Dysphoria	.24	1.14	
	Movement	-.11	-.41	
	Dysphoria*Movement	-.12	-.41	
Positive mood (T3)				
	Step 1			.08†
	Dysphoria	-.28	-1.81†	
	Step 2			.00
	Dysphoria	-.28	-1.78†	
	Movement	.03	.20	
	Step 3			.01
	Dysphoria	-.19	-.93	
	Movement	.17	.64	
	Dysphoria*Movement	-.19	-.65	
Total mood (T3)				
	Step 1			.08†
	Dysphoria	-.29	-1.86†	
	Step 2			.01
	Dysphoria	-.29	-1.85†	
	Movement	.12	.75	
	Step 3			.00
	Dysphoria	-.27	-1.30	
	Movement	.15	.56	
	Dysphoria*Movement	-.04	-.13	

† $p < .10$

Discussion

This experiment aimed to extend the results obtained in Study 2.1, (i.e., overt head movements may moderate the influence of dysphoria on mood regulation processes) to other body movements (i.e., arm movements). The results obtained, however, do not allow us to confirm our hypotheses. According to the first hypothesis, we expected that the level of dysphoria would be a predictor of mood regulation abilities, that is, participants with higher levels of dysphoria at T1 should be less able to regulate their mood states after the sad mood induction. In contrast with the findings obtained in Study 2.1, in the present study only a tendency in the expected direction was found. The characteristics of the sample may account for this result. Although a similar sample size was used in both experiments (42 participants in Study 2 vs. 40 participants in Study 3), both samples differed in dysphoric/non-dysphoric ratio at T1. Whereas in Study 2.1 almost a half of the participants (i.e., 47.6 %) scored 10 or higher in BDI-II, in the present study less than a quarter (i.e., 22.5%) reported scores 10 or higher. Therefore, it seems that dysphoric individuals were underrepresented in the present study in comparison to the previous one, and this fact could explain the absence of statistical significance supporting hypothesis 1.

The second (and the most important) hypothesis of the present study did not receive any support from the present data. Arm movements did not play any role in mood regulation. Although it is always difficult to explain null experimental effects, there are some potential factors that might explain them. First, it may be possible that the association of arm extension and arm flexion with avoidance and approach is not universal and cannot be found, or it is less pronounced, in some cultures. To our

knowledge, no findings similar to those by Cacioppo et al. (1993) have ever been tested in Spanish samples. Secondly, it could be that contextual changes in the design may affect the perceived valence of the movement. For example, in a series of three experiments, Centerbar and Clore (2006) found that the valence of stimuli being approached or avoided affected the attitudinal impact of approach-avoidance action. Their results suggest that movements are situated acts, and that changing contextual conditions may affect how the movement affects attitude. In their experiment, the authors used both mild negative and mild positive stimuli and found an interaction between arm movement and stimulus valence. In our experiment, only positive stimuli were used, and this modification of the setting may have affected the influence of arm movements on mood regulation. Thirdly, it might be argued that vertical and lateral head movements, but not arm movements, are strongly associated with positive and negative attitudes. Independently of the context, in western cultures lateral head movements usually imply refusal or negative attitude, whereas vertical head movements imply approval or positive attitude (e.g., Fusaro, Harris, & Pan, 2012). However, the arm flexion and extension association with approach and avoidance may not be as univocally associated with attitudes. For example, one may flex an arm to avoid the pain produced by a hot object or to protect the face from a ball shot, and one can extend an arm to reach a juicy piece of fruit, to give a present or to express joy and success. In this case, the influence of the context could be larger than in the case of head movements.

Conclusion

The present study aimed to test whether arm movements may have an influence on mood regulation. Contrary to what was hypothesized, dysphoria levels did not affect

participants' ability to regulate their mood. Nevertheless, a trend in the expected direction was found, and the observed differences between both samples could account for this result. Most importantly, the data do not allow us to suggest any influence of arm movements on mood regulation. A closer look at some previous studies suggests that contextual factors may affect the meaning of performed actions. The overall discussion and implications of these findings, within the context of the rest of the experiments, will be presented in the General Discussion Section.

Study 3: Overt head movements and mood regulation with neutral images.

Abstract

Rahona, Ruiz Fernández, Rolke, Vazquez and Hervas (2013; Study 2.1) found that overt head movements can moderate the effect of dysphoria on mood regulation processes. In Study 2.1, however, only an indirect influence and not a direct influence, of overt head movements on mood regulation was found. It is possible that the regulatory task (i.e., watching positive images) conditioned this result, producing a ceiling effect that could have masked a direct influence of overt head movements on mood regulation. The present study aimed to examine this question by introducing some changes regarding Study 2.1. Specifically, the design of Study 2.1 was replicated, this time including neutral images (instead of positive ones) in the experimental task. Additionally, some possible shortcomings of the previous studies are taken into account in the design of the present study. In order to enhance the power of statistical analyses, a greater sample (N=52) is used and additional measures of positive and negative affect (Positive and Negative Affect Scales, PANAS; Watson, Clark, & Tellegen, 1988) are collected. The results obtained in the present study suggest that overt head movements do not have a direct influence on mood regulation processes. Additionally, our results show that levels of dysphoria do not predict the participants' ability to regulate mood when the task only includes images with neutral content. These results and their implications are discussed.

Most of the research devoted to examining the influence of overt head movements on cognitive processes has been carried out in the field of persuasion and attitude change (e.g., Briñol & Petty, 2003; 2007; Briñol, Petty, & Wagner, 2011; Förster, 2004; Förster & Strack, 1996; Neumann, & Strack, 2000; Tom, Petersen, Lau, Burton, & Cook, 1991; Wells & Petty, 1980). Most of these studies have suggested indirect paths of influence of overt head movements, but some have also suggested a possible direct path. For example, Briñol and Petty (2007, p. 3) proposed five alternative mechanisms where performing bodily responses may facilitate attitude change: "(a) affecting the amount of issue-relevant thinking that occurs, (b) producing a bias to the thoughts that come to mind, (c) affecting structural properties of the thoughts, such as thought confidence, (d) serving as persuasive evidence (i.e., arguments), and (e) serving as simple peripheral cues to change". Among these proposed paths of influence, the first three seem to be indirect, whereas the last two seem to be more direct paths of influence. Similarly, Wells & Petty (1980) suggested that nodding (shaking) head movements indirectly affect attitude change by facilitating the appearance of positive (negative) thoughts, and inhibiting the appearance of negative (positive) thoughts. In comparison, Tom et al. (1991) suggested that under certain conditions, head movements may act as a simple cue for attitude change, a more direct mechanism of influence in attitude change. Although it is not possible to directly extrapolate results from research on persuasion to the study of mood regulation, it is plausible to hypothesize that some of the paths of influence of bodily states on persuasion are broad enough to affect other psychological processes, such as mood regulation. In study 2.1, an indirect influence of bodily states on mood regulation processes was found. To be more specific, dysphoric participants in the nodding condition showed that, similar to non-dysphoric participants, they were able to regulate

mood states. On the contrary, dysphoric participants in the shaking condition presented a diminished ability to regulate their mood states. This result indicates that bodily states could act as a moderator between levels of dysphoria and an individual's efficiency of mood regulation, but in study 2.1 a direct influence of overt head movements on mood regulation was not found. Some studies suggest that the variation of some parameters of the experiment (e.g., the valence of the information presented to participants) modulates the influence of bodily states in attitudes (e.g., Briñol & Petty, 2003; Centerbar & Clore, 2006). In study 2.1, positive pictures were presented to participants while they performed either vertical or lateral head movements. Under these conditions, an indirect influence, but not a direct one, of overt head movements in mood regulation was found. But it is generally accepted that paying attention to positive information is a strategy that facilitates mood regulation (e.g., Fredrickson & Levenson, 1998; Sanchez, Joormann, Marker, LeMoult, & Vazquez, 2013). Therefore, it is possible that the improvement of mood regulation ability due to the visualization of positive material has produced a ceiling effect, thereby masking a direct influence of bodily states on mood regulation. The aim of the present study is to try to reveal more information about the path of influence of overt head movements on mood regulation. In the present study, the positive pictures included in the experimental task of Studies 2.1 & 2.2 were replaced by pictures of neutral faces from the FACES database (Ebner, Riediger, & Lindenberger, 2010).

To overcome one limitation that arose in the previous two studies, in the present study we collected a 30 percent greater sample size (N = 52) because the number of dysphoric individuals might be too small in a sample of around 40 participants (as was the case in Study 2.2).

Moreover, in order to have a more reliable measure of participants' mood states, additional measures of positive and negative affect (Positive and Negative Affect Scales, PANAS; Watson, Clark, & Tellegen, 1988) were collected.

We hypothesize that the conditions of the present study may facilitate the appearance of a direct influence of bodily states on mood regulation. Additionally, we expect that participants with higher levels of dysphoria would show poorer mood regulation than participants with lower levels of dysphoria. An interaction between levels of dysphoria and the movement performed similar to the one obtained in experiment 2.1, is also expected.

Method

Participants.

52 undergraduate students (40 women, 12 men) with an average age of 20.8 years participated in this 30-min experiment. Participants were recruited at the Complutense University of Madrid in exchange for course credits. Due to a technical problem, one participant could not complete the study and was excluded from the analyses. Additionally, three participants guessed the real aim of the experiment, and were also excluded. Therefore, analyses were performed on the 48 valid cases.

Stimuli and apparatus.

The sad mood induction was identical to the one used in Studies 2.1 & 2.2. Instead of the 25 positive images from the International Affective Picture System database (IAPS; Lang, Bradley, & Cuthbert, 2008), 25 pictures of neutral faces from the FACES database (Ebner, Riediger, & Lindenberger, 2010) were used in this experiment. Visual references were identical to those used in Study 2.1.

Measures.

As in study 2.1, measures of positive and depressive mood state (Mood state assessment; EVEA; Sanz, 2001), dysphoria (Beck Depression Inventory-II; BDI-II; Beck, Steer & Brown, 1996) and anxiety (Beck Anxiety Inventory; BAI; Beck, Epstein, Brown & Steer, 1988) were collected. Additionally, measures of positive and negative affect (Positive and Negative Affect Scales, PANAS Watson et al., 1988) were also collected. All scales reported high to very high internal consistencies. In the present study, the internal consistencies of the positive and depressive subscales of the EVEA, BDI-II, BAI and the positive and negative affect scales, were α = .94, α = .81, α = .85, α = .87, α = .88, α = .89, respectively.

Procedure and design.

The procedure and design were identical to those used in Study 2.1, with the only exception of the images used in the experimental task and the inclusion of the PANAS (Watson et al., 1988).

Statistical analyses.

All statistical analyses performed in Study 3 are identical to those performed in Study 2.1.

Results

Participants in the nodding experimental condition did not significantly differ at Time 1 from participants in the shaking experimental condition in most of the relevant variables (BDI-II, BAI, positive and negative affect, and depressive and total EVEA, all $p > .23$). Both groups significantly differed at Time 1 in their positive EVEA scores with

a higher mean score in the nodding (27.52) than in the shaking (22.52) group [$t(46)= 2,38$; $p= .02$].

The sad mood induction procedure produced a significant decrease in positive affect [$M_{T1-T2} = -7.46$; $t(46)= 6.49$; $p<.001$], as well as positive [$M_{T1-T2} = -10.88$; $t(46)= 9.76$; $p<.001$] and total mood [$M_{T1-T2} = -20.94$; $t(46)= 9.97$; $p<.001$]. The sad induction also produced a significant increase in depressive mood ($M_{T1-T2} = 10.06$; $t(46)= -7.65$; $p<.001$) and negative affect ($M_{T1-T2} = 6.46$; $t(46)= -5.91$; $p<.001$).

The results of the stepwise regression analyses are presented in Table 3. In contrast to the results of experiment 2.1, in the present study, dysphoria levels (i.e., BDI-II scores at the beginning of the experiment) did not predict participants' changes in affect or mood (all β ranged between .14 y -.08, all $p> .33$). Similar to what was found in experiment 2.1, but contrary to our second hypothesis, the movement performed did not seem to directly affect mood regulation or affective change (ps> .19). The movement performed did not interact with the initial levels of dysphoria (all ps > .69), except for negative affect, where a marginally significant interaction [t(46)= -1,75, p= .09] arose. Since no moderation effect was found, simple slope analyses were not performed in the present study.

Table 3

		β	*t*	ΔR^2
Negative mood (T3)				
	Step 1			.02
	Dysphoria	.14	.97	
	Step 2			.02
	Dysphoria	.15	1.01	
	Movement	-.15	-1.04	
	Step 3			.00
	Dysphoria	.13	.63	
	Movement	-.15	-1.03	
	Dysphoria*Movement	.02	.12	

Positive mood (T3)				
	Step 1			.00
	Dysphoria	-.01	-.08	
	Step 2			.04
	Dysphoria	-.01	-.04	
	Movement	-.20	-1.33	
	Step 3			.004
	Dysphoria	.05	.26	
	Movement	-.20	-1.32	
	Dysphoria*Movement	-.08	-.41	
Total mood (T3)				
	Step 1			.01
	Dysphoria	-.10	-.65	
	Step 2			.002
	Dysphoria	-.09	-.63	
	Movement	-.04	-.27	
	Step 3			.003
	Dysphoria	-.04	-.19	
	Movement	-.04	-.27	
	Dysphoria*Movement	-.08	-.37	
Negative affect (T3)				
	Step 1			.005
	Dysphoria	.07	.46	
	Step 2			.004
	Dysphoria	.07	.47	
	Movement	-.06	-.41	
	Step 3			.07†
	Dysphoria	.32	1.57	
	Movement	-.06	-.41	
	Dysphoria*Movement	-.36	-1.75†	
Positive affect (T3)				
	Step 1			.006
	Dysphoria	-.08	-.54	
	Step 2			.003
	Dysphoria	-.08	-.55	
	Movement	.05	.35	
	Step 3			.002
	Dysphoria	-.04	-,18	
	Movement	.05	,35	
	Dysphoria*Movement	-.06	-,30	

† $p < .10$

Discussion

In Study 3, no influence of the level of dysphoria on the ability to regulate mood was found. Dysphoric participants recovered from a sad mood in the presence of neutral information just as well as non-dysphoric participants did. This is a very interesting result, as it suggests that whatever the influence of dysphoric states on the ability to regulate mood, it only affects the incremental effect due to the presence of positive information. It suggests that the mechanisms involved in mood recovery facing neutral information are, to some extent, different to the ones involved in mood regulation. Moreover, it seems that only the latest are affected in subclinically depressed individuals.

No direct influence of overt head movements in mood regulation was found. In combination with previous results from studies 2.1 and 2.2, this result suggests that the path of influence of bodily states in mood regulation is indirect, rather than direct.

Finally, no significant interaction between head movements and dysphoria levels was found. This result suggests that, whatever the influence of overt head movements, only the mechanisms involved in the incremental effect due to the presence of positive information are affected. In combination with the results of Study 2.1, this result suggests a link between bodily states and attention or interpretation biases towards positive information (Hertel & Mathews, 2011) and/or functioning of the BAS system (Hervas & Vazquez, 2013), supporting the notion that bodily states affect mood regulation through an indirect pathway.

General Discussion

In the previous sections of this work, we have introduced the theoretical framework of embodiment, the scientific research that this approach has motivated and we have described three experiments aimed to examine the influence of bodily states on mood regulation processes.

In this final section, our intention is to highlight the implications that the results of the experiments conducted, in particular, and the implications of the embodiment account, in general, can have for clinical psychology.

In our opinion, the results of the studies conducted could be easily connected to previous literature concerning emotion regulation, cognitive and attention biases and depression, adding new findings and perspectives to the current state of the art.

Discussion of the results of Study 2.1.

In Study 2.1, we confirmed our hypotheses. On the one hand, symptoms of dysphoria related to a difficulty to regulate sad mood states were found. Although emotional regulation problems in depression were suggested many years ago (e.g., Teasdale, 1988), they have been consistently supported in the empirical literature in recent years (see a review in Joorman & Gotlib, 2010). For example, Peeters, Nicolson, Delespaul, and deVries (2003), found that in comparison to a non-depressed control group, depressed patients remained in a negative mood state produced by daily negative events for a longer period of time. Additionally, the study by McMakin, Santiago, and Shirk (2009) showed that dysphoric participants have difficulties in maintaining positive emotional states in response to positive stimuli (i.e., positive emotion eliciting video clips), compared to nondysphoric controls. In Study 2.1, we found that higher

levels of dysphoria were related to participants' difficulties to regulate mood. Thus, the results of Study 2.1 add more evidence in favor of the existence of mood regulation deficits on individuals with higher levels of dysphoria.

The most relevant result of Study 2.1 was the finding that overt head movements moderate the relationship between dysphoria and the participants' ability to regulate their sad mood states. Whereas head movements did not affect the ability to regulate sad mood states among participants with lower levels of dysphoria, the movements of the head affected the ability to regulate sad mood of participants reporting higher levels of dysphoria. Among dysphoric participants, those who performed nodding head movements while watching positive pictures showed a similar ability to regulate mood than non-dysphoric individuals. On the contrary, only dysphoric participants who performed shaking head movements showed a diminished ability to regulate sad mood states. Whether the performance of nodding head movements boosts the ability of dysphoric participants to regulate mood, or, on the contrary, the performance of shaking head movements inhibits the regulatory process is a question that could not be answered with the present results. We will comment on this point further in the limitations section.

Another line of research that could be explored refers to the mechanism through which bodily cues influence processes related to psychological disorders. For example, in Study 2.1 we found a moderation effect of overt head movements on the relationship between dysphoria levels and the participants' ability to regulate mood, but the movement performed was not *directly* associated with the ability to regulate mood. However, it is still possible that overt head movements may have a direct influence on mood regulation. In particular, in this study participants were exposed to positive images, and there is evidence which suggests that paying attention to positive

information has regulatory effects (Joorman, Siemer, & Gotlib, 2007; McMakin et al., 2009). Thus, the effects on mood regulation produced by watching positive pictures could have improved participants' mood in a way that left no room for the influence of a motor component, thus producing a ceiling effect. Therefore, it could not be discarded that a *direct* influence of overt head movements on mood regulation was masked in Study 2.1. Study 3 was aimed to further explore the possible direct influence of overt head movements on mood regulation.

Nevertheless, the implications of these results are interesting from a clinical point of view and are original and novel contributions to the current literature. However, it represents only a small step in the study of the contributions of the body to mood regulation processes. There is still a whole line of research that could be followed starting from this milestone. For example, future studies should examine whether the moderation effect of overt head movements could be generalized to other approach/avoidance movements (Study 2.2), or whether an influence of bodily states (e.g., facial gestures, body postures) could be found in cognitive or emotional processes related to psychological disorders other than mood regulation.

Discussion of the results of Study 2.2.

In Study 2.2 we found a trend in the expected direction supporting the notion that symptoms of dysphoria are related to an inability to regulate sad mood states. The fact that dysphoric individuals were underrepresented in Study 2.2, in comparison to the previous one, may explain the absence of statistical significance supporting hypothesis 1.

The second and most relevant hypothesis of Study 2.2 did not receive any support from the present data. Arm movements neither directly affected mood regulation, nor moderated the influence of dysphoric states in the participants' ability to regulate mood. Yet, this lack of significance can shed some light on the role of different bodily components on mood regulation. In contrast with overt head movements, arm movements did not affect the influence of dysphoria on mood regulation ability. This result may indicate that only those movements of core elements of the body (e.g. the head), rather than peripheral parts (e.g., the right arm) are successful in altering affect. Interestingly, a review of previous research is in accordance with this view. There are more examples of influences in cognitive or emotional processes of core elements of the body, such as overt head movements (e.g., Briñol & Petty, 2003; 2007, Förster & Strack, 1996; Tom et al., 1991, Wells & Petty, 1980), upright versus slumped body posture (e.g., Riskind & Gotay, 1982; Wilson & Pepper, 2004), seated versus supine body posture (Harmon Jones & Peterson, 2009), facial gestures (e.g., Niedenthal, 2007; Niedenthal et al., 2009; Strack et al., 1988; Susskind et al., 2008), combined facial and musculoskeletal elements (e.g., Duclos et al. 1989, Flack et al., 1991, Duclos & Laird, 2001) or body movements that require the combined action of several parts of the body (e.g., gait patterns, Koch et al., 2009; Michalak et al., 2009), than from peripheral elements of the body, such as arm movements (e.g., Cacioppo et al., 1993; Cretenet & Dru, 2008; Dru & Cretenet, 2004; 2005; Förster & Strack, 1997; 1998; Friedman & Foster, 2000; 2002; Maxwell & Davidson, 2007). Importantly, none of the studies referred to involving arm movements observed an influence on emotional or affective processes and, in addition, among them, results are not always univocal (e.g., Centerbar & Clore, 2006; Rottevel & Phaf, 2004). An alternative interpretation is that only those body movements that are tightly linked to feelings or emotions (e.g., facial gestures,

upright or slumped posture) or those movements that are univocally associated with acceptance (approach) or refusal (avoidance), such as overt head movements, are more likely to affect, at least indirectly, mood regulation processes. Movements are situated acts, and changing contextual conditions may affect how the movement affects attitude (Centerbar & Clore, 2006). Vertical and lateral head movements are, at least in our culture, unambiguously associated with positive and negative attitudes. No matter what the context, in western cultures lateral head movements imply refusal or negative attitude, whereas vertical head movements imply approval or positive attitude. Arm flexion and extension associated with approach and avoidance are not as unambiguous. For example, Cacioppo et al., (1993) posit that people flex their arms to attract a desired object towards them. Nevertheless, one may also flex an arm to avoid the pain produced by a hot object or to protect the face from a ball shot. Similarly, these authors posit that arm extensions are performed in order to push an undesired object away from the person, but it is not less true that one can extend an arm to reach a juicy piece of fruit, to give a present or to express joy and success. In this case, the influence of the context is much greater than in the case of head movements.

Study 2.2 was unable to extend results from Study 2.1 to other body movements. Yet, this fact does not preclude the potential importance of embodiment for studying processes related to mood and anxiety disorders in particular and clinical psychology in general. Many other movements, alone or in combination, may have the same potential to affect mood regulation as overt head movements have (e.g., upright vs. slumped posture, gait patterns, facial gestures) –e.g., Peper and Lin (2012). Moreover, mood regulation is only one of the processes related to clinical disorders that may be used as a target process to see the influences of bodily states. In fact, according to the literature of embodiment and the implications of some theoretical models (e.g., ICS, SPAARS), an

influence of bodily states could be expected on, for example, the maintenance of dysfunctional schemas, the awareness of cardiac reactivity (Herbert et al., 2010), or the facilitation of peaks of anxiety that lead to panic attacks (Hagenaars, Stins, & Roelofs, 2012). In our view, the amount of possible research in experimental clinical psychology that the present work could motivate is immense, as the body can have an influence on many different aspects of the emotional experience (i.e., elicitation, intensity, and differentiation) – see Moors (2009).

Discussion of the results of Study 3.

Study 3 aimed to test whether changing the experimental conditions may help to reveal a direct influence of overt head movements on mood regulation. Whereas in Study 2.1 overt head movements were juxtaposed to the visualization of positive images, in Study 3 the positive images were replaced by pictures of neutral faces extracted from the FACES database (Ebner, Riediger, & Lindenberger, 2010), *ceteris paribus* all other experimental settings.

The first hypothesis of Study 3 expected symptoms of dysphoria to be related to difficulties in regulating sad mood states. In comparison to what we obtained in studies 2.1 and 2.2, where a significant and a marginally significant influence in the expected direction were found, respectively, in Study 3 no influence of the level of dysphoria on the ability to regulate mood was found. Previous studies have found evidence that indicates that paying attention to positive information helps participants to regulate their sad mood states (e.g., Joorman et al., 2007; Sanchez et al., 2013, Rahona et al., 2013). Additionally, some of them found that the level of depressive symptoms affected the regulatory ability of participants (e.g., Joorman et al., 2007, Rahona et al., 2013). The

absence of influence of dysphoria levels on the regulatory ability of participants observed in Study 3 indicates that when participants are presented with neutral information, no differences can be found between dysphoric and non-dysphoric participants in their ability to regulate mood. This is an interesting result which, in combination with the results from Study 2.1, suggests a link between the diminished ability to regulate mood present in dysphoric participants and attention or interpretation biases towards positive information (Hertel & Mathews, 2011) and/or low functioning of the BAS system (Hervas & Vazquez, 2013). That is, both dysphoric and non-dysphoric participants seem to have their automatic mood repair system preserved, as they effectively recover from a sad mood in presence of neutral information. The presence of positive information, however, seems to boost the ability to regulate sad mood mainly in non-dysphoric participants. This result suggests a different internal disposition of participants depending on the kind of information presented and their mood condition. A similar result was found by Joorman, Seemer and Gotlib (2007). In their study, these authors examined the ability of currently depressed, formerly depressed, and never- depressed participants to regulate sad mood through the recall of positive memories or through distraction. Whereas distraction was effective in all participants, the recall of positive memories improved mood only in the never-depressed participants group. Formerly depressed participants' sad moods remained unchanged and the mood of depressed participants worsened after they were asked to recall positive memories. Therefore, the processing of positive information to regulate mood may not have a direct and uniform effect on participants' mood, as it may interact with their current mood or clinical condition (see also similar findings with subclinical dysphoric and nondysphoric participants in Joorman & Siemer, 2004).

The fact that mood regulation deficits in dysphoric participants only appear in the presence of positive information, but not with neutral information, reinforces the notion of a low functioning of the BAS system among dysphoric individuals (e.g., Hervas & Vazquez, 2013). This result has a second implication that could be relevant from a clinical point of view. In our design, mood states were assessed at three different moments: at the beginning of the experiment, after a sad mood induction and after an experimental task that lasted approximately 10 minutes. The experimental task included watching neutral images and performing overt head movements. Both dysphoric and non-dysphoric participants showed a significant mood recovery after the experimental task (which lasted exactly the same amount of time), not differing in the amount of their mood repair. This result indicates that, in regulating their mood, all participants profited to the same extent from available information neutrally valenced. Yet, only non-dysphoric participants and dysphoric participants who nodded seemed to benefit from the use of positively valenced information. It is possible that cognitive biases present in non-dysphoric participants may explain this differential ability. For instance, Grafton et al. (2012) have shown that inducing a cognitive positive bias in participants through a standard dot-probe methodology, boosts positive emotional affectivity after experiencing successful outcomes in an experimental task. Thus, it may be possible that some previous cognitive biases present in our non-dysphoric participants could enhance their abilities to regulate their mood when processing positive information.

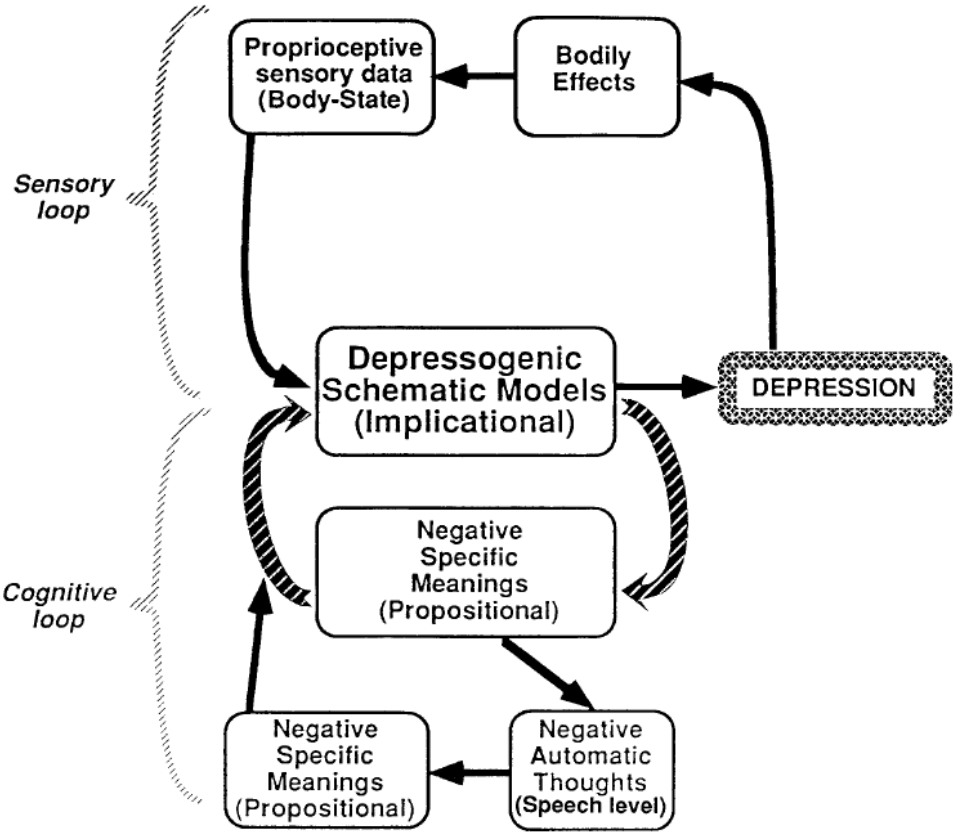
The second hypothesis of Study 3 explored the potential direct influence of overt head movements on mood regulation. We expected a moderation effect similar to the one obtained in Study 2.1. Neither the hypothesis of a direct influence of overt head movements on mood regulation nor the moderation of overt head movements on the relationship between dysphoria and mood regulation obtained support in the results of

Study 3. In combination with the results of Study 2.1, this pattern of results strongly suggests that no direct influence of overt head movements on mood regulation processes is to be expected, as it was neither found when positive or neutral images were used. It is possible, though, that a different result may be found when manipulating bodily states that spontaneously appear when individuals are in a sad mood (e.g., facial expressions, slumped posture). Nevertheless, the answer to this question is still unknown and it is crucial that future research ought to address this important issue.

Embodiment and mood regulation: Possible underlying mechanisms

We propose three alternative, non-exclusive paths of influence that could explain the present results. First of all, according to the multilevel models of emotion (Philippot, Baeyens, Douilliez, & Francart, 2004; Power & Dalgleish, 1997; 2008; Teasdale & Barnard, 1993), and in particular to the ICS model (Teasdale & Barnard, 1993), there is a somatic path of maintenance of depressive symptoms (Body states → Implicational System→ Somatic-Visceral-Body effects → Body states; Teasdale & Barnard, 1993, p. 127). Figure 3 illustrates this notion.

Figure 3.



Schematic model of the cognitive and sensory loop responsible for the maintenance of depression

Supporting this notion, there is ample evidence suggesting that physical activity can be effective as a treatment for many symptoms and disorders. For example, in the treatment of anxiety, some meta-analyses have revealed the effectiveness of physical exercise for subjects with high anxiety (Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991; Sarris et al., 2012). Other studies have reported that patients suffering from somatic disorders can also benefit from physical exercise to reduce their anxiety (Herring, O'Connor, & Dishman, 2010). In the field of depression treatment, there is metaanalytic evidence showing that behavioral activation increases well-being both in clinical and subclinical depressed participants (Mazzuchelli et al., 2010). More specifically, the effectiveness of aerobic and nonaerobic exercise is comparable to first-choice treatments for depression, such as pharmacological therapy or cognitive-behavior therapy (Ahmadi, Samavat, Sayyad, & Ghanizadeh, 2002; Dunn, Trivedi, Kampert,

Clark, & Chambliss, 2005; Lawlor & Hopker, 2001; Jacka and Berk, 2012). Some other studies have found that exercise can reduce the negative cognitions associated with depression (Lash, 2000), as well as hopelessness (Hembree, 2001).

Although the evidence of the positive impact of physical exercise in several psychopathologies is consistent, the physiological and psychological mechanisms that underlie its anxiolytic, anti-panic and anti-depressant effects remain unclear (Hovland et al., 2013). Some authors suggest that one possible mechanism through which physical activity can reduce anxiety is by exposing the individual to bodily sensations, which is known to be highly relevant in the treatment of panic disorders (Chambless, Caputo, Bright and Gallagher, 1984). Other authors suggest that the experience of motor capacity is partially responsible for the antidepressant effects of exercise (Bodin & Martinsen, 2004; Lindeman & Abramson, 2008). An alternative (or integrative) explanation in line with the ICS model is that engaging in physical activity interrupts the physical loop that maintains symptoms of depression and anxiety, and the bodily sensations produced by an active body are incongruent with the information stored at the implicational level. Going back to the results of Study 2.1, it is possible that the different proprioceptive information originating from the different head movements performed by participants may have interrupted (or activated) the somatic loop, leading to the regulation of (or to the persistence of) a sad mood state.

A second possible pathway of influence is through the repercussion of head movements, or their physiological correlates, on the Behavioral Approach System (BAS). Activation of the BAS is associated with behaviors of approximation to desirable outcomes, feelings of euphoria, and reward seeking (Hervas & Vazquez, 2013). The tripartite model of anxiety and depression (Clark & Watson, 1991) proposed that low BAS is specific to depression disorder. In addition, Depue and Iacono (1989)

also suggested that symptoms such as depressive mood, psychomotor retardation, anhedonia, or fatigue are consequences of an abnormally low functioning of the BAS. Several studies have confirmed that depressed individuals present significantly lower levels in the BAS scale (Kasch, Rottenberg, Arnow, & Gotlib, 2002; Pinto-Meza et al., 2006), as well as reduced reactivity to positive stimuli in general (e.g., Berenbaum & Oltmanns, 1992; Rottenberg, Kasch, Gross, & Gotlib, 2002) and to rewards in particular (Henriques & Davidson, 2000; Henriques, Glowacki, & Davidson, 1994; McFarland & Klein, 2008), and also longitudinal studies have reported the ability of BAS scores to predict better recovery of depressed patients (Kasch et al., 2002; McFarland, Shankman, Tenke, Bruder, & Klein, 2006; Rottenberg et al., 2002). Indeed, there is increasing evidence that a lack of interest in positive experiences, or a diminished reactivity to them, might be the basis of mood dysregulation which, in turn, would perpetuate anhedonia (Hervas & Vazquez, 2013). In Study 2.1, participants performed either a head nodding or a head shaking movement while watching positive pictures. Although the individuals who participated in the study were not clinically depressed, low reactivity of the BAS system were also observed among non-clinical dysphoric individuals (e.g., Hervas & Vazquez, 2013). Performing nodding head movements is generally associated with acceptance or approach behaviors, whereas performing shaking head movements is associated with rejection or avoidance behaviors (e.g., Fusaro, Harris, & Pan, 2012). It is therefore plausible to suggest that the proprioceptive information produced by head nodding, could have activated the low functioning BAS on dysphoric participants, and this activation led to a better mood regulation in response to positive pictures.

The third possible path of influence that we consider plausible in explaining the moderation effect that overt head movements had on the influence of dysphoria on

participants' ability to regulate mood, is through the modification of participants' cognitive biases.

Prior evidence of this issue is still anecdotic. For example, studies in the field of embodiment have demonstrated that performing movements related to avoidance (approach) in response to alcoholic (non-alcoholic) images could modify the bias towards alcohol cues in alcoholic patients (Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011). Furthermore, in that study, patients under this cognitive and bodily modification bias procedure had lower relapse rates than the control group. More generally, results from studies by Tom, Petersen, Lau, Burton and Cook (1991) or by Briñol and Petty (2003) indicate that performing overt head movements can influence participants' attitudes. The results of Study 2.1 could reflect the modification of attentional biases present on dysphoric participants. It is possible that dysphoric participants, who in general, tend to pay less attention to positive cues (e.g., Joormann & Gotlib, 2007), modified their attentional pattern as a consequence of the approach (i.e., nodding) movement performed, either paying more attention to the positive images, or changing their attitude towards the positive images, or both. According to the 'embodied validation' hypothesis (Briñol, Petty, & Wagner, 2011, p. 1043), "the confidence that emerges from one's body and its position or movements can magnify the effect of anything that is currently available in people's minds, including [...] cognitions, emotions, goals, and so forth. That is, confidence applies to whatever mental contents are salient and available at the time". This theory may help to explain how performing body movements can moderate the influence of positive content in people's mood state through cognitive bias (e.g., interpretative bias).

If an influence of movements on cognitive biases was demonstrated, it would have important implications. It is generally recognized that emotional biases in

attention, interpretation, and memory contribute to emotional disorders (Hertel & Mathews, 2011; Mathews & MacLeod; 2005; Matt, Vazquez & Campbell, 1992). When participants pay attention to emotional stimuli, healthy individuals show a tendency to look especially to positive but also to negative cues in comparison to neutral ones. In contrast, those participants prone to anxiety or depression tend to direct their attention to negative cues, particularly when such cues are related to individual emotional concerns (Hertel & Mathews, 2011) and these attentional biases seem to be causally related to the onset and maintenance of mood disorders (e.g., Clasen et al., 2012). For example, in comparison to non anxious individuals, participants prone to anxiety tend to direct their attention more towards threatening than to neutral cues (for a meta-analysis see Bar-Haim, Lamy, Pergamin, Baker-mans-Kranenburg, & van Ijzendoorn, 2007). Similarly, whereas non-depressed controls are more likely to attend to positive stimuli, depressed individuals show attentional biases towards stimuli more related to depression (e.g., Hankin, Gibb, Abela, & Flory, 2010; Joormann & Gotlib, 2007). A new line of research aims to study whether procedures designed to change these negatively biased styles of cognitive processing could be used to benefit patients. The studies on cognitive bias modification (CBM) use systematic practice in alternative processing styles (Koster, Fox, & MacLeod, 2009), in order to change biases that contribute to undesirable emotional reactions in participants vulnerable to emotional or anxiety disorders (Hertel & Mathews, 2011). Recent metaanalytic reviews of these new procedures suggest that these procedures can be useful not only in reducing cognitive biases but also in significantly reducing symptoms in participants with anxiety or depression (Hallion and Ruscio, 2012; Todd, Cunningham, Anderson & Thompson, 2012). These procedures are also a source of evidence of the role of cognitive factors in the maintenance of emotional disorders.

Implications for the role of distraction in mood regulation

Concerning the expected moderation of overt head movements on the influence of dysphoria on mood regulation, this hypothesis did not receive support in the results of Study 3. Therefore, in Study 3, neither a direct influence of dysphoria on mood regulation, nor a moderation of overt head movements on this influence could be found. These results, in combination with those of Study 2.1, suggest that whatever the path of influence of head movements on the relationship between dysphoria levels and mood regulation might be, it seems that it takes place only under certain conditions. In order to explain these results, we built on previous research that found different regulatory outcomes when participants performed a distractory task, than when the task performed involved the recall of positive information (Joorman et al., 2007). In this study, it was discovered that distraction was effective in all participants, whereas the recall of positive memories only improved mood in the group of never-depressed participants. Distraction strategies lead to an automatic repair of mood states that is mainly due to stop attention being directed to negative information. In comparison, strategies that involve the processing of positive information combine the effects of stop attention being directed to negative information, with additional ones due to addressing attention towards positive information. This distinction is in line with the model proposed by Gyurak, Gross, and Etkin (2011). This model suggests that two different kinds of regulatory mechanisms exist. Some mechanisms would be automatic and implicit, whereas others would be more controlled and explicit.

We suggest that effects from both distraction and positive information processing appeared in Study 2.1. On the contrary, in Study 3, only effects due to distraction arose.

According to the results obtained in Study 2.1 and Study 3, it seems that overt head movements had an influence on the effects due to positive information processing, but not on the effects due to distraction strategies. As we have already discussed, a normal-functioning BAS system in the presence of positive information, leads to regulated mood states and this is also supported by evidence showing that positive cognitive biases boost positive emotional reactions when processing positive outcomes (Grafton et al., 2012). The proprioceptive information could be tied to the BAS system through three different proposed channels. Internal proprioception could affect the BAS directly or indirectly, influencing either an individual's attitudes or cognitive biases. Interestingly, our results are in line with the somatic marker hypothesis. Damasio states that *"when different somatic markers are juxtaposed to different combination of images, they modify the way the brain handles them, and thus operate a bias"* (Damasio, 1994, p.199). Similarly, from the field of embodied persuasion, Briñol, Petty and Wagner (2011, p.1043) state that *"...the confidence that emerges from one's body and its position or movements can magnify the effect of anything that is currently available in people's minds, including […] cognitions, emotions, goals, and so forth. That is, confidence applies to whatever mental contents are salient and available at the time".* Both accounts suggest that bodily states can modify the influence that some information has on cognition and emotion. According to our results, the movement performed interacts with the kind of information presented and participants' emotional state, resulting in an enhanced or diminished ability to regulate one's own mood.

Limitations.

Some limitations present in the three studies must be acknowledged. One of these limitations refers to the absence of a no-movement control condition in the three experiments. Without a no-movement control condition, it is impossible to know which movement is more responsible for the interaction obtained in Study 2.1. It could be that the nodding effect is equivalent to a control (no-movement condition) and the effect lies in what the shaking movement is doing in order to undermine the normal mood regulation. Although most of the embodiment studies do not include a control condition (e.g., Briñol & Petty, 2003; Cacioppo et al., 1993; Tom et al., 1991), to exemplify the specific effectiveness of head movements more convincingly, it would be necessary to examine whether the interaction pattern obtained persists when comparing a nodding with a no-movement condition.

Another limitation of the present study is that it does not reveal information about the mechanisms involved in the moderation pattern. As suggested by Briñol & Petty (2007), bodily movements can influence mental processes by affecting some underlying processes (e.g., producing a bias, serving as peripheral cues for change). Similarly, in the discussion section we have proposed some alternative paths of influence, through which bodily states generated by the performance of different overt head movements may be affecting the mood regulation process. Nonetheless, our design does not allow conclusions about the mechanisms involved to be extracted and this is a question that future research may address.

A third limitation which should be acknowledged concerns the sample included in the three experiments. Results were obtained in student samples. Therefore, the possible clinical implications of the present work must be considered with caution. To

infer clinical implications of the present study, it is necessary to presume the existence of a continuum among subclinical and clinical depressive states. Nonetheless, it is also possible that differences between clinical and subclinical depression are not only quantitative, but also qualitative. In any case, it would be recommendable to examine whether the pattern of results obtained in Study 2.1 holds up when comparing clinically depressed individuals with never depressed euthimic controls.

Finally, it is important to mention that in all the three experiments a cover story was used to hide the real aim of the experiment. Consequently, movements were performed without a deliberate intention to modify mood states. It is possible that intentionality does not modify the effect of performing overt movements in whatever process they may have an influence, but it is also possible that a different result could be obtained when movements are deliberately performed in order to, for example, modify mood states. In fact, there is some evidence, from the field of attention bias modification, that when participants are aware of the contingencies aimed at modifying their mood, the effects on anxiety scores are lower than in the standard implicit learning condition (MacLeod et al., 2009; as cited in McLeod and Mathews, 2012).This should be taken into account for future research, as well as for drawing conclusions for its application in psychological interventions.

Another limitation concerns the fact that our studies have only focused on the regulation of sadness. Yet, other clinical conditions, such as addictions, bipolar disorders (Stange et al., 2012), or anxiety disorders (Cisler and Olatunji, 2012), may follow different mood regulation mechanisms. Furthermore, given the relatively neglected study of positive emotions in clinical disorders (see a review in Carls et al., 2013), it would be interesting to differentiate, in dysphoric participants, mechanisms

involved in reducing negative moods from mechanisms involved in enhancing positive moods, which may act jointly or separately.

Finally, the cognitive and emotional processes by which regulation is achieved will also be important to analyze in future research. It would be interesting to analyze the role that different emotion regulation strategies (e.g., reappraisal, suppression, rumination, or distraction), which are used by healthy participants (see metaanalysis by Miles, Sheeran, & Webb, 2013), have in different clinical conditions.

Contributions of embodiment to applied psychology.

As we have seen within the present work, the embodiment account could have important theoretical and practical implications in the field of clinical psychology. On the one hand, considering the role of bodily states on mental processes could help psychologists to have a more holistic view of individuals' cognitive and emotional functioning, as stated by Damasio (1994, p.118) "*the separation between mind and body is probably just fictional. The mind is embodied, in the full sense of the term*". The Lindeman and Abramson (2008) model suggests that simulation of motor incapacity could be responsible for motor symptoms of depression. This model has directly emerged from some theoretical principles of the embodiment account, and represents an example of how embodiment could help to enrich the way we understand psychological disorders. Although Lindeman and Abramson's model only refers to symptoms of motor incapacity, providing theoretical basement in support of their hypotheses, it does not constrain the possible influence of bodily states on motor symptoms of depression. In fact, the results obtained in the present work suggest that the influence of bodily states goes beyond symptoms of motor incapacity. At least in subclinical samples,

vertical head movements in combination with positive images seem to improve the mood regulation ability of dysphoric individuals. Bodily states could interact with internal and external information influencing other emotional processes related to depression (e.g., emotional processing of bereavement). Thus, the simulation of motor incapacity could account for the motor symptoms of depression, but the contribution of bodily states to other higher order processes involved in depression is still rather unexplored.

Similarly, concepts and ideas based on the embodiment approach could help to enrich some theoretical models of anxiety and fear disorders. For example, Eysenck's incubation theory (Eysenck, 1968), contrary to what classical conditioning models would expect, proposes that fear and anxiety reactions to conditioned stimuli eventually increase even when the conditioned stimuli are presented repeatedly without reinforcement. This model suggests that the conditioned response that follows the conditioned stimulus could eventually be strong enough to counteract the decremental effects of extinction. The simulation of the different modal components of the nocive responses, and specially their somatic components, could predispose individuals to an incubation process, acting as a somatic marker (Damasio, 1994) and biasing or exacerbating the perception of danger. In light of the results obtained by Duclos and Laird (2001), who found individual differences in the impact that performing facial gestures and body postures has on individuals' emotional state, it is also possible that not only the strength of the conditioned response, but also the sensitivity of individuals to their internal states could underlie the incubation process.

The embodiment account reflects the idea that multimodal information is reenacted producing higher order cognitive and emotional processes. This is a notion in line with the cognitive and emotional functioning proposed by multi-level models of

emotion (Philippot, Baeyens, Douilliez, & Francart, 2004; Power & Dalgleish, 1997; 2008; Teasdale & Barnard, 1993). According to these models, different interacting subsystems are specialized in the processing of certain kinds of information. The interaction of these subsystems accounts for the cognitive and emotional functioning of individuals. Some of these models focus on how the multimodal information processed by the different subsystems lead to the maintenance of depressive states (e.g., ICS, Teasdale & Barnard, 1993), whereas others mainly focus on anxiety disorders (e.g., SPAARS, Power & Dalgleish, 1997). Despite their interest, these models have generated a small amount of research, probably due to their complexity. Studies based on paradigms with an origin on the embodiment approach, such as those included in this work, could help to add more evidence in support of the notions proposed by multi-level models of emotion.

It is important to note that some of these paradigms have been successfully employed to modify bias towards alcohol (Wiers et al., 2011) and that the combination of cognitive bias modification based on approach and avoidance movements with CB interventions improved the percentage of relapse in alcoholic patients. This is an initial step that signals how the embodiment approach can help to enrich interventions by including the body in therapeutic practice. Future research may also address the question whether bodily states that are associated with approach or avoidance could be manipulated in order to improve treatments in which exposure is the main component. Moreover, these results may also encourage us to devote more efforts to the study of the efficacy of psychological interventions that include somatic elements as central in psychological therapy.

In our view, the most important contribution of the embodiment approach is the restitution of the role of the body in psychological processes. The body is not only the

primary tool that individuals have to interact with the environment, but also a source of information and the substrate in which abstract cognitive and emotional processes have their origin. Taking into account the tight link existing between bodily states and emotion and also the suggested link between bodily states and cognitive processes, it seems that incorporating the body into clinical practice may open a bottom-up way of intervening in dysfunctional psychological processes, complementary to the more frequent top-bottom interventions, emanating from traditional cognitive approaches. The inclusion of the somatic path as a research topic common to all psychological approaches might become one of the main challenges of psychology over the next decades.

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