DOCTORADO EN PSICOLOGÍA DE LOS RECURSOS HUMANOS

Trabajo colaborativo en entornos virtuales: diseño y evaluación de una intervención para la mejora de la eficacia y el bienestar

Tesis Doctoral

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INTRODUCCIÓN

Entornos virtuales de colaboración

A lo largo de los últimos años se ha observado una importante y creciente aplicación de la tecnología que se extiende a la práctica totalidad de las esferas de nuestra sociedad. Se ha generalizado el uso de internet y el acceso a la información y la comunicación mediante tecnología ha sido un elemento clave para el desarrollo y la sostenibilidad global de nuestra sociedad (ITU, 2021). Esta difusión de la tecnología ha cristalizado en su uso principalmente para la interacción social y la comunicación (Cascio & Montealegre, 2016). Además, la digitalización y las nuevas formas de trabajo se abren paso, especialmente impulsadas por el impacto de la COVID-19 (Feitosa & Salas, 2021; van Laar et al., 2017).

La pandemia ha estimulado cambios en los procesos de interacción en grupo y la colaboración virtual (Klonek et al., 2021). La proliferación de diversas herramientas y plataformas han permitido interactuar, crear e intercambiar información rápidamente, generando **entornos virtuales de colaboración** donde los participantes comparten conocimiento y se influyen mutuamente (Gilson et al., 2021; Peters & Manz, 2007). Por ello, en la actualidad el trabajo tal y como lo conocíamos se ha transformado debido al uso creciente de las herramientas virtuales de colaboración en las organizaciones y el énfasis en los equipos (Mak & Kozlowski, 2019; Mathieu et al., 2017). Así, surge un mayor interés por los equipos virtuales en sus distintas configuraciones (Dulebohn & Hoch, 2017; Gilson et al., 2021; Larson & DeChurch, 2020). Además, el uso de la colaboración virtual ha facilitado también el desarrollo de estructuras de equipo más complejas y de mayor tamaño, con objetivos amplios como los sistemas de equipos múltiples (Turner et al., 2020; Zaccaro et al., 2012) o las comunidades virtuales (Henri & Pudelko, 2003). De este modo, definimos estas unidades de colaboración virtual –equipos o comunidades– como grupos de individuos dispersos geográfica, cultural y/o temporalmente que se comunican e interaccionan a través de entornos virtuales de colaboración. Estos grupos poseen una o más metas comunes,

muestran interdependencias en relación con sus tareas, flujo de trabajo, intereses y/o resultados. Además, comparten una cierta estructura común, realizan una actividad interactiva y mantienen una red dinámica de relaciones entre sus miembros (DeSanctis & Monge, 1999; Jarvenpaa & Leidner, 1998; Martínez-López et al., 2016; Rheingold, 1993; Zornoza et al., 1996). Esta definición incluye por lo tanto lo que tradicionalmente ha sido estudiado como equipos virtuales, pero abarca también la aplicación de herramientas de trabajo colaborativo virtual a configuraciones grupales más amplias, con distintos niveles de interdependencia y objetivos a largo plazo o más difusos, como son las comunidades virtuales (Henri & Pudelko, 2003; Rheingold, 1993). Por lo tanto, el estudio de la colaboración virtual en grupos de trabajo permite analizar equipos o comunidades virtuales, variando estos entornos en base a las características estructurales y sociales que se den en cada contexto.

Entornos virtuales de colaboración: Ventajas y oportunidades

Los equipos y las comunidades virtuales se integran en las organizaciones con el objetivo de **mejorar** los resultados organizacionales y suponen una herramienta efectiva para el fomento del trabajo, el desarrollo de sus miembros, las propias organizaciones y la sociedad (Ardichvili, 2008; Demerouti, 2020; Dulebohn & Hoch, 2017; Martínez-López et al., 2016; Zhang et al., 2010). Así, a nivel organizacional el uso de entornos virtuales de colaboración puede impulsar el crecimiento organizacional aumentando la ventaja competitiva especialmente en entornos inciertos y complejos (Caligiuri et al., 2020; Chai & Park, 2022) y tener por tanto un impacto económico significativo (Jimenez et al., 2017). Por ejemplo, permite a las organizaciones seleccionar a los mejores miembros para su composición sin importar su localización geográfica, con mayor flexibilidad y eliminando costes asociados a su movilidad. Además, se optimiza el flujo de tareas al permitir el trabajo continuo incluso a través de distintas zonas horarias (Dulebohn & Hoch, 2017; Jimenez et al., 2017). Estos entornos también favorecen las nuevas fuentes de información, la adecuada gestión del

conocimiento y un mayor aprendizaje en las organizaciones (Bergiel et al., 2008; Henri & Pudelko, 2003; Jimenez et al., 2017).

De manera paralela, la investigación constata que las mayores ventajas y oportunidades pueden recaer sobre el propio grupo y sus miembros. Los miembros de estos entornos colaborativos se benefician de la autonomía, la flexibilidad y la reducción de tiempos de desplazamiento que permite trabajar en un equipo virtual (Morrison-Smith & Ruiz, 2020) y puede generar diversas experiencias positivas individuales. Así, los equipos virtuales bien gestionados aumentan la motivación, el aprendizaje y la satisfacción laboral de sus miembros (Nurmi & Hinds, 2016). De igual modo, la participación en comunidades virtuales de distinta índole favorece el reconocimiento personal, la autoestima, el aprendizaje y el bienestar, siendo su principal beneficio la socialización *sin barreras* -el establecimiento y mantenimiento de relaciones entre los miembros- (Henri & Pudelko, 2003; Martínez-López et al., 2016).

Por otro lado, un elemento clave en el funcionamiento de los entornos virtuales de colaboración es la diversidad de los miembros. Esta diversidad (en términos sociales o técnicos) puede tener un impacto positivo en el grupo y sus resultados (Gilson et al., 2015; Jimenez et al., 2017). Así, las personas con *backgrounds* formativos diversos y que están en distintas localizaciones pueden facilitar no sólo la innovación y creatividad, sino también la adaptabilidad y la toma de decisiones (Chamakiotis et al., 2013; Gibbs et al., 2017; Gilson et al., 2015; Jimenez et al., 2017). Gracias a la divergencia de perspectivas de los miembros, estos equipos tienen más y más variados recursos cognitivos, con mayor capacidad de solución de problemas, debido a que les permite valorar adecuadamente las alternativas y evitar fenómenos de pensamiento grupal y conformidad (Jimenez et al., 2017).

Todos estos beneficios han favorecido que la mayor parte de las grandes compañías pasen a trabajar con equipos con algún grado de virtualidad (Alves et al., 2022; Mak &

Kozlowski, 2019). Junto a ello, el uso frecuente y actual de los entornos de colaboración virtual aumentaron significativamente con la pandemia (Chai & Park, 2022; Gilson et al., 2021). En la actualidad más del 75% de los trabajadores consideran óptimo el uso de estos entornos como forma de trabajar en el futuro (Accenture, 2021; RW3 CultureWizard, 2022).

Esta evidencia sobre sus ventajas y los datos de uso implican un cambio de paradigma en la gestión de la colaboración virtual y las relaciones interpersonales (Gilson et al., 2021; Malinen, 2015; Rolls et al., 2016). Es por esto por lo que las investigaciones recientes buscan estudiar los mecanismos de eficacia de estos entornos virtuales a través de diferentes configuraciones y variables (*p. ej.* (Alsharo et al., 2017; DeChurch & Mesmer-Magnus, 2010; Hernández Soto et al., 2021)). Sin embargo, su estudio es complejo puesto que los modelos actuales de eficacia grupal apuntan al papel combinado e interactivo de las características y procesos grupales en los resultados y las reacciones afectivas (Mathieu et al., 2019). De manera similar, se ha apuntado a la influencia mutua entre los resultados afectivos y de eficacia (tesis de grupos/equipos felices y productivos, García-Buades et al., 2020; Peñalver et al., 2019). Por ello, comprender y mejorar el funcionamiento de los entornos virtuales de colaboración requiere un estudio combinado de los inputs (características estructurales, recursos), los procesos que se dan; y los resultados objetivos y subjetivos. Pese a ello, una parte importante de la literatura sobre grupos virtuales se ha centrado en resultados de eficacia, pero el bienestar no ha sido suficientemente integrado en las investigaciones en equipos virtuales (Gilson et al., 2015) y literatura reciente hace un llamamiento para continuar comprendiéndolo en diversos ámbitos (García-Buades et al., 2020; Peiró et al., 2021).

Retos de los entornos virtuales de colaboración

Considerando las ideas previamente expuestas, existe una necesidad de diseñar e implementar estrategias y programas de intervención para mejorar la eficacia y el bienestar. La literatura científica ha puesto de manifiesto que la interacción en entornos de colaboración

virtual no es percibida de manera equivalente al contexto presencial (Gilson et al., 2021). Atendiendo a las teorías del filtrado de claves (*Cues-filtered-out)* (Culnan & Markus, 1987), la comunicación mediada por ordenador[1] en entornos colaborativos hace que se pierdan matices, claves no verbales y contextuales, perjudicando la función social y comunicativa que tienen. Por ello, el uso de tecnología y la comunicación mediada por ordenador hace que, junto con los muchos beneficios antes enumerados, haya una serie de **retos** inherentes y derivados de su uso (Chai & Park, 2022; Hoch & Dulebohn, 2017; Morrison-Smith & Ruiz, 2020).

En primer lugar, la investigación realizada en este tópico ha evidenciado que existe un conjunto de retos vinculados a la gestión eficiente de las *limitaciones técnicas* y *las características estructurales* asociadas a la propia tecnología (Curşeu et al., 2008; Morrison-Smith & Ruiz, 2020), tal como proponía la Teoría de la Riqueza del Medio (Daft & Lengel, 1986). La riqueza del medio hace referencia a la capacidad de un medio de comunicación de transmitir múltiples sistemas de claves verbales y no verbales simultáneamente (Walther, 2011). Así, habrá formas de comunicación mediada por ordenador con mayor riqueza comunicativa (por ejemplo, sistemas que puedan transmitir imágenes y sonido sincrónicamente (*i.e.* en directo) y con alta calidad), y sistemas cuya riqueza sea muy limitada (por ejemplo, un sistema de mensajería escrita en un foro). Por ello, debido a la menor riqueza del medio que generalmente se da en entornos virtuales es común que haya pérdidas en la transmisión de la información, interrupciones y fallos en la comunicación. Estas limitaciones técnicas pueden afectar a la coordinación de la tarea, generar

[1] Usamos el término "comunicación mediada por ordenador", debido a su uso generalizado, sin embargo la literatura reciente ha propuesto que se haga referencia a esta como comunicación digital o virtual, para englobar a otras herramientas más allá del ordenador (Carr, 2020)

ambigüedad de rol, agotamiento, sobrecarga cognitiva y desencadenar malentendidos entre sus miembros (Hertel et al., 2005; Nurmi, 2011).

Además, el uso de la tecnología requiere unas competencias específicas para su uso cuya falta puede perjudicar a sus usuarios al aumentar las demandas laborales (Demerouti, 2020). Es decir, el nivel de competencia técnica de los usuarios puede suponer una demanda extra de esfuerzo sobre sus tareas intrarol. En esta línea, basándonos en la Teoría de las Demandas y Recursos Laborales (Bakker & Demerouti, 2017; Demerouti et al., 2001), cualquier característica organizacional puede suponer una demanda o un recurso laboral. Una demanda laboral implica un aspecto que requiere un esfuerzo y tiene asociado un coste psicológico mediante el proceso de deterioro de la salud, mientras que el aumento de los recursos mejorará el engagement y los resultados positivos mediante el proceso motivacional (Bakker & Demerouti, 2017). En base a esto, una inadecuada implantación y gestión de la tecnología, la falta de competencia sobre la misma, así como los potenciales problemas técnicos pueden suponer un aumento de las demandas laborales y una falta de recursos para los miembros de los entornos virtuales de colaboración, que afectarían a su eficacia y bienestar.

En segundo lugar, otro reto que es necesario afrontar cuando se trabaja en entornos virtuales de colaboración tiene que ver con la *distancia* y la percepción de *aislamiento* de los usuarios (Morrison-Smith & Ruiz, 2020; Nurmi, 2011). La distancia geográfica y temporal entre los miembros de un grupo de trabajo afecta a los procesos y al funcionamiento colectivo y puede tener un fuerte impacto en el logro de sus resultados. En esta línea, los resultados de investigación muestran que muchos usuarios de entornos virtuales de colaboración manifiestan soledad y desconexión (Morrison-Smith & Ruiz, 2020), lo que conlleva pérdidas de información importantes en comparación con un contexto presencial (Gilson et al., 2021). Además, se percibe más aislamiento entre los miembros por trabajar físicamente alejados con compañeros a los que posiblemente no han conocido en persona

(*p. ej.* no hay interacciones informales presenciales entre sus miembros) (S. K. Johnson et al., 2009). Este aislamiento se basa en la percepción cognitiva y afectiva de falta de presencia de los otros miembros, que requiere ser gestionado adecuadamente (Blanchard, 2021; O'Leary et al., 2014). Así, en entornos virtuales de colaboración la conciencia de los compañeros y su contexto se ve reducida (Morrison-Smith & Ruiz, 2020). En consecuencia, es más posible que se den conductas de *free riding* u holgazanería social, en las cuales uno o varios miembros de un grupo ejercen menos esfuerzo y contribuyen menos que lo que les correspondería en relación con la meta común (Monzani et al., 2014). En este sentido, si atendemos al Modelo de Identidad Social de los Efectos de la Desindividualización (comúnmente conocido por su acrónimo SIDE en inglés) (Lea & Spears, 1992; Reicher et al., 1995), el papel del anonimato y la identificabilidad de los miembros del grupo juega un papel determinante en el funcionamiento de los entornos virtuales de colaboración. Esta teoría plantea que en los entornos virtuales la potencial falta de información e identificación de los miembros hace que la identidad personal y las diferencias individuales se reduzcan. En paralelo, los atributos e identidades grupales se hacen más salientes, los individuos se centran en las normas grupales y la atribución sobre el resto de miembros se hace en base a la poca información disponible (Chan, 2010; Reicher et al., 1995). De acuerdo con estos principios se puede explicar por qué en entornos virtuales de colaboración la responsabilidad individual sobre los resultados pueda verse difuminada. Por lo tanto, la percepción de aislamiento, la falta de información y monitorización informal sobre el progreso de los compañeros puede acabar perjudicando la eficacia y el bienestar del grupo y sus miembros.

En tercer lugar, se constata también el reto de lograr una gestión eficiente de la *diversidad*, lo que implica atender a la composición de los equipos o comunidades virtuales. La composición grupal hace referencia a la forma en la que las características individuales se agregan en el grupo. Así, inicialmente la literatura exploró las características sociodemográficas de la composición y la diversidad como el género, la educación o la

procedencia. Tras esto, otras medidas de diversidad (*p.ej.* rasgos de personalidad) adquirieron importancia por su influencia en la eficacia de los grupos virtuales (Mathieu et al., 2014; Taras et al., 2019; Wang & Hsu, 2012). Por lo tanto, variables como los rasgos de personalidad (Curşeu et al., 2019; Prewett et al., 2018) o la inteligencia emocional (Pitts et al., 2012; Quisenberry, 2018) se vuelven clave para entender el reto de cómo la composición grupal puede influir en los entornos virtuales de colaboración. Para el estudio de la composición grupal de variables psicológicas se han adoptado diversas aproximaciones teóricas, cómo por ejemplo la perspectiva contingente o la perspectiva configuracional, considerando que la forma en que las características se unen al formar el grupo influirá en los resultados de bienestar y eficacia (Moynihan & Peterson, 2001). Además, la naturaleza geográficamente dispersa y la diversidad de los grupos virtuales pueden hacer de la composición un arma de doble filo. Si bien es verdad que, tal como se exponía, la diversidad de los miembros en los entornos virtuales de colaboración puede proporcionar beneficios (*p. ej.* más creatividad o capacidad de resolver problemas (Chamakiotis et al., 2013; Taras et al., 2019)), esta no está exenta de dificultades, especialmente si no se gestiona adecuadamente. Así, cuando dos o más características de diversidad (*p. ej.* género y nivel educativo) se visibilizan y alinean entre miembros del grupo, pueden surgir brechas o fallas de diversidad (*faultlines)* que generan **subgrupos** (Lau & Murnighan, 1998). De manera similar al modelo SIDE, el "Modelo *Faultline"* (Lau & Murnighan, 2005) nace de las teorías de la Identidad Social y la Categorización Social (Tajfel, 1978; Tajfel & Turner, 1979). En base al modelo *faultline* se plantea que las diferencias visibles que se alinean entre los miembros hacen que estos se perciban como pertenecientes a distintas categorías sociales. Una vez estas categorías sobresalen, los individuos se refuerzan y tienen más opiniones positivas de su categoría (o endogrupo), mientras que posiblemente aumentarán las opiniones negativas de las otras categorías (exogrupo), generándose sesgos intergrupales (Meyer et al., 2011, 2014). Es decir, se generan percepciones de nosotros versus "los otros". Esta situación puede ser más frecuente en el entorno virtual de colaboración por las

diferentes localizaciones, las diferencias culturales o de procedencia de los usuarios; y la falta de claves contextuales. Estas pueden hacer que la diversidad destaque como consecuencia de las diferencias en recursos, conocimiento o las distintas identidades personales (Carton & Cummings, 2012; Gilson et al., 2015). En esta línea, la literatura previa pone de manifiesto los efectos negativos que los subgrupos pueden tener para los equipos (Meyer et al., 2014; van der Kamp et al., 2015) y los equipos virtuales (Chiu & Staples, 2013; Gibbs et al., 2017). Así, los subgrupos pueden reducir el desempeño y la satisfacción; y aumentar el conflicto interpersonal y otros resultados negativos (Carton & Cummings, 2012; Gibbs et al., 2017). En consecuencia, resulta necesario estudiar las condiciones particulares en las cuales los subgrupos podrían disminuir el bienestar y la eficacia del equipo y, aún más prioritario, la forma en que las brechas pueden desactivarse o reducirse (Gilson et al., 2015; van der Kamp et al., 2015).

Por último, y en parte derivado de los anteriores retos, el uso de entornos virtuales de colaboración influye sobre la emergencia y el desarrollo del *afecto grupal*, a veces referido como emoción grupal (*p. ej.* Kelly & Barsade, 2001) o clima afectivo (*p. ej.* Gamero et al., 2008), entre otros. En los entornos colaborativos, como los equipos, el afecto es una parte esencial de las dinámicas grupales (Bell et al., 2018; Gamero & González-Romá, 2020). Esta experiencia grupal nace de la combinación de las experiencias afectivas individuales de los miembros y el contexto afectivo en el que operan (Barsade & Gibson, 1998). Así, el afecto grupal puede ser entendido como una experiencia afectiva compartida o mantenida por los miembros del grupo (Barsade & Knight, 2015).

El afecto grupal tiene un papel preponderante en los resultados del equipo y de los miembros, influyendo sobre diversos resultados como la satisfacción, el bienestar, el desempeño, la creatividad y la toma de decisiones (Barsade & Knight, 2015; Druskat & Wolff, 2001; Gamero & González-Romá, 2020). Este afecto grupal en entornos virtuales se puede ver perjudicado debido a las restricciones de la tecnología y de la interacción resultante

(Cheshin et al., 2011; S. K. Johnson et al., 2009; D. Kim et al., 2014; Pitts et al., 2012). Por ejemplo, Johnson y cols. (2009) apuntan a que los equipos virtuales experimentan menos niveles de afecto positivo y compromiso, especialmente si hay un alto grado de virtualidad. En esta misma tendencia, Cheshin y cols. (2011) observan que los equipos virtuales tienen un mayor afecto negativo, especialmente en un medio de baja riqueza comunicativa (comunicación escrita).

Afrontando los retos de los entornos virtuales de colaboración

En el contexto previamente expuesto, la **gestión afectiva o emocional del equipo** tiene un papel fundamental en su funcionamiento en entornos virtuales. La gestión emocional del equipo implica regular las emociones de sus miembros durante la interacción grupal, calibrando su afecto que puede verse influenciado por factores contextuales, personales y situacionales (George, 1990; Marks et al., 2001). En entornos colaborativos presenciales, el desarrollo de esta gestión emocional se hace de manera informal y automática, a través de claves verbales y no verbales que se producen durante la interacción (Ekman, 1974; Ekman et al., 1976). Sin embargo, en entornos virtuales de colaboración se requiere de una serie de protocolos y normas explícitas que permitan a los usuarios manifestar, interpretar y gestionar sus emociones (Barsade & Gibson, 2012). Esta gestión emocional puede guiar a los miembros del equipo en la comprensión de qué formas de expresar el afecto son reforzadas o sancionadas por el grupo (Druskat & Wolff, 2001; Kelly & Barsade, 2001), en base a su influencia sobre los procesos y resultados del equipo. Esta explicitación activa de la gestión emocional hace que el equipo pueda gestionar situaciones estresantes, calmando a los miembros frustrados o mostrando empatía (Marks et al., 2001). Estas y otras acciones similares pueden afectar a los procesos colaborativos que se den en el marco de la interacción e impactará en los resultados (Blomqvist & Levy, 2006). Así pues, considerando la importancia del afecto y de su gestión eficaz, hay una necesidad clara de comprender su

funcionamiento en los entornos virtuales colaborativos (Barsade & Gibson, 2012; Gamero & González-Romá, 2020) de tal modo que se genere consenso (Hollenbeck, 2008) sobre la forma óptima de promoverlo en entornos virtuales de colaboración.

La gestión del afecto y los demás retos de los entornos virtuales de colaboración pueden ser abordados mediante intervenciones de desarrollo del equipo o de formación en competencias específicas para ello (Lacerenza et al., 2018; Salas et al., 2018). Así, la investigación previa manifiesta la necesidad de continuar diseñando estrategias e intervenciones que preparen a sus miembros para trabajar en contextos virtuales de colaboración (Morrison-Smith & Ruiz, 2020; Peñarroja et al., 2015). No obstante, los datos muestran que solo uno de cada cuatro trabajadores recibieron formación para mejorar sus resultados en equipos virtuales (RW3 CultureWizard, 2020) y un 40% sigue teniendo que enfrentarse a los retos de la comunicación mediada por ordenador (RW3 CultureWizard, 2022). Por ello, las intervenciones pueden optimizar los resultados del equipo y su propio desarrollo dirigiéndose a cualquier faceta de la colaboración virtual (*p. ej.* gestión emocional, reducción de subgrupos, barreras en la comunicación, uso de herramientas específicas). Además, todas estas acciones formativas pueden realizarse a través de las herramientas de colaboración virtual gracias a los últimos desarrollos tecnológicos (Lacerenza et al., 2018).

Intervención: entrenamiento en gestión emocional del equipo

Por todo lo mencionado previamente, y atendiendo a la importancia del afecto y la gestión emocional del equipo (Barsade & Knight, 2015; Gamero & González-Romá, 2020), así como a la necesidad de desarrollar intervenciones grupales (Lacerenza et al., 2018; Parker & Grote, 2020; Salas, 2015; Salas et al., 2018), en la presente tesis doctoral se diseña y pone a prueba un **entrenamiento en gestión emocional del equipo en contextos virtuales** (Gamero, González-Anta, Peñarroja, et al., 2021)

La intervención diseñada consistió en una formación estructurada orientada a desarrollar competencias (Lacerenza et al., 2018) para la gestión emocional de equipos en contextos de alta virtualidad, con comunicación escrita. Para su diseño se atendió a la Teoría del Procesamiento de la Información Social (SIP por su siglas en inglés, (Walther, 1992)). La teoría SIP se contrapone en parte a las teorías del filtrado de claves y plantea que, si bien es cierto que la tecnología puede limitar la transmisión de las claves no verbales y contextuales, estas constricciones se deben a la limitación temporal y de adaptación de la comunicación (Sprecher, 2014). Por ello, plantea que sí es posible transmitir información emocional y que haya comunicación relacional -orientada al establecimiento de vínculos- a pesar de las limitaciones. Para ello, esta teoría plantea, primero, el fundamento de *intercambiabilidad de claves sociales*. Este fundamento indica que cuando hay claves comunicativas faltantes, los miembros adaptan su comunicación interpersonal e instrumental con las claves que permita el medio de comunicación utilizado. En un medio de mínima riqueza como la comunicación por chat es posible que los individuos adapten la codificación y la descodificación de la información social mediante el contenido del mensaje, el estilo y el *timing*. El segundo fundamento de esta teoría es la *agregación de información en el tiempo*. Esto implica que la tasa de intercambio de información social en entornos virtuales de colaboración difiere de contextos presenciales. Por ello, y a pesar del principio de intercambiabilidad de claves, la información transmitida se reduce. En un contexto presencial las señales se transmiten simultáneamente a través de distintos sistemas (entonación, inflexiones en la voz, expresiones faciales, dobles sentidos). En cambio, en la comunicación mediada por ordenador la limitación de sistemas hace que sólo haya un sistema o sistemas primarios que hacen todo el trabajo, reduciendo por tanto la calidad y aumentando el tiempo de codificación-descodificación (Walther, 2011, 2015).

Atendiendo a los fundamentos de la teoría SIP como base, nuestro entrenamiento tuvo por objetivo mejorar la capacidad de los equipos virtuales para (1) identificar, expresar y

regular las emociones en entornos virtuales de colaboración; y (2) gestionar un clima emocional positivo en el equipo. Para tal fin, el entrenamiento se centró en el desarrollo de la expresión de emociones mediante el concepto de ciberhabla (Cuadrado et al., 2015) basado en el uso de distintos recursos como emoticonos (Derks et al., 2008; Skovholt et al., 2014), el paralenguaje (Kalman & Gergle, 2014) y la gestión temporal de las interacciones (Kalman & Rafaeli, 2011). Mediante el uso de estos recursos se pueden generar códigos comunes entre los miembros del equipo y facilitar la emergencia de normas que hacen que se gestione el afecto grupal y las interacciones (Druskat & Wolff, 2001; Ghuman, 2011). Además, el fomento de un clima emocional positivo hace que se regulen los procesos colaborativos del grupo y se mejoren los resultados del equipo (Järvelä et al., 2016; Pitts et al., 2012). Para ello, se plantearon diversas estrategias de gestión grupal del afecto en contexto colaborativo online. Por ejemplo, se propuso la reevaluación cognitiva, el apoyo mutuo mediante el refuerzo explícito de conductas positivas o fórmulas para motivar a los miembros en la consecución de las metas (Ayoko et al., 2012; Choi et al., 2015; Druskat & Wolff, 2001).

Con este entrenamiento se pretendió superar los retos que se planteaban en las secciones previas, con especial énfasis en el papel de la composición y la diversidad. La presencia de subgrupos en un equipo virtual puede inhibir el desarrollo de claves comunicativas incluso si este grupo interacciona por un largo periodo de tiempo (fundamento de agregación de información de la teoría SIP). Sin embargo, planteamos que el entrenamiento permitiría desactivar los efectos negativos de los subgrupos y mejorar los resultados gracias a la adecuada interacción intergrupos e integración afectiva que se produciría en el grupo (Cronin et al., 2011; van der Kamp et al., 2015). Así, al formar a estos equipos en la adecuada expresión y regulación emocional; y dotarles de herramientas para generar un clima emocional positivo, se pueden mejorar sus procesos y sus resultados a pesar de los retos presentes e inherentes a su funcionamiento.

OBJETIVOS DE LA TESIS Y ESTUDIOS

La presente tesis doctoral pretende contribuir a la investigación desarrollada hasta el momento en relación con los equipos y las comunidades virtuales. Para ello, planteamos los siguientes **objetivos generales:** en primer lugar, *estudiar la eficacia y el bienestar en entornos virtuales de colaboración,* identificando factores personales y grupales que favorecen estos resultados y, en segundo lugar, diseñar y probar una intervención basada en el *entrenamiento en gestión emocional del equipo* con el fin de mejorar los procesos, el bienestar y la eficacia de los equipos virtuales.

Tal como indicábamos, la eficacia y el bienestar de equipo constituyen dos resultados fundamentales para su funcionamiento y sostenibilidad. Por un lado, la efectividad o **eficacia** del equipo ha sido ampliamente estudiada en la literatura organizacional (*p. ej.* (Hackman & Morris, 1975; Marks et al., 2001; Stevens & Campion, 1994). Tradicionalmente se ha considerado como eficacia del equipo el producto del trabajo en términos de cantidad y calidad. Posteriormente se consideraron también reacciones e intenciones conductuales o conductas de los miembros del equipo como son la viabilidad o el absentismo (Mathieu & Gilson, 2012). En base a ello, podemos definir eficacia como el grado de ajuste entre las acciones y resultados obtenidos por el equipo; y unos estándares dados por los objetivos del equipo o de la tarea (Hackman, 1990; Zornoza et al., 1996). Así, siguiendo un enfoque sistémico, la eficacia incluye los resultados objetivos y los resultados de percepción del equipo (Mathieu et al., 2019; Salas et al., 2005). Esta doble perspectiva es relevante, ya que, en el caso de los entornos virtuales de colaboración, el rendimiento o producción objetiva del equipo puede verse afectado por diversos factores externos; y por tanto no ser suficiente para estudiar o valorar la eficacia del equipo (Salas et al., 2005). A partir de estos artículos, la eficacia de equipo se ha operacionalizado a través de variables como desempeño o viabilidad del equipo y se ha estudiado a nivel individual, a nivel de equipo o en contextos más amplios (García-Buades et al., 2020).

En paralelo a la eficacia, a la hora de estudiar grupos en entornos virtuales es también importante atender a las reacciones subjetivas que los miembros experimentan como subproducto fruto de la interacción (Mathieu et al., 2008). Por ello, **el bienestar** en equipos virtuales también puede verse directamente influido por las características y retos particulares de la colaboración virtual (Gilson et al., 2015). Debido a esto, el bienestar en equipos virtuales se considera un resultado central; mostrando una relación directa con los resultados tangibles y el rendimiento (Gilson et al., 2015; S. K. Johnson et al., 2009). El bienestar ha sido conceptualizado desde dos amplias perspectivas, el bienestar hedónico y el eudaimónico (Fisher, 2010). El primero hace referencia al bienestar cognitivo y afectivo que se valora en términos de altas experiencias afectivas positivas y momentos satisfactorios; mientras que el segundo hace referencia a una perspectiva vital en la que haya propósito, crecimiento, autenticidad y plenitud (Ryan & Deci, 2001; Sonnentag, 2015). Comprender el bienestar en nuestro contexto requerirá por tanto atender a elementos de ambos enfoques como parte de una estructura global (Peiró et al., 2014). Como en el caso de la eficacia, el bienestar puede estudiarse a nivel individual o de equipo y a través de diferentes variables específicas (García-Buades et al., 2020). De hecho, Kashdan y cols (2008) ya remarcan la importancia del estudio de variables específicas -*p. ej.* satisfacción- frente al uso de constructos amplios (Kashdan et al., 2008).

Considerando lo anterior, los objetivos generales expuestos se concretan a continuación en una serie de **objetivos específicos** que se plasman en los cuatro artículos que forman parte de esta tesis doctoral por compendio de publicaciones. En ellos estudiamos la eficacia y el bienestar en dos entornos virtuales de colaboración: comunidades virtuales (estudio 1) y equipos virtuales (estudios 2, 3 y 4) en los que ponemos a prueba el entrenamiento en gestión emocional de equipo.

El objetivo 1 se desarrolla en el **estudio 1** (González-Anta, Orengo, Zornoza, Peñarroja & Martínez-Tur, 2021; de ahora en adelante “estudio 1”) que lleva por título *“**Understanding***

the Sense of Community and Continuance Intention in Virtual Communities: The Role of Commitment and Type of Community".

Basándonos en el modelo SIDE, este estudio analiza cómo promover la sostenibilidad de las comunidades virtuales a través del apoyo socioemocional y los procesos relacionales que surgen de la interacción entre sus miembros (Blanchard & Markus, 2004; Walther, 1992). Específicamente, se estudió cómo el sentido de comunidad virtual influía en la intención de continuar participando; y el rol mediador del compromiso. En comunidades virtuales la participación activa de los miembros es necesaria para la obtención de las metas de la comunidad (Zhao et al., 2013) y, por tanto, es importante promover la participación para que la comunidad pueda desarrollarse y ser viable (*i.e.* sostenible). Para promoverla, se ha destacado la importancia del sentido de comunidad virtual (Blanchard, 2008; Blanchard & Markus, 2004), pero debido a la dispersión y anonimato de las comunidades virtuales, hipotetizamos también que el compromiso media la relación. Además, debido a la distinta naturaleza de cada tipo de comunidad (Dholakia et al., 2004), se estudió cómo afectan las características estructurales. Para ello, también analizamos el papel moderador de los distintos tipos de comunidad virtual -comunidades virtuales de interés, comunidades de aprendizaje y comunidades de práctica-. El estudio resultante se muestra en la figura 1.

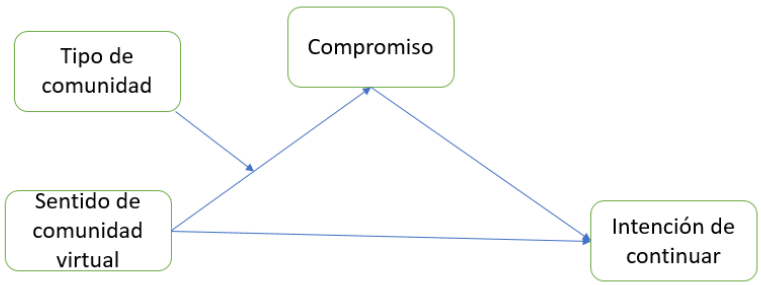

Fig. 1. Modelo teórico estudio 1 (González-Anta, Orengo, Zornoza, Peñarroja, & Martínez-Tur, 2021).

El objetivo 2 se desarrolla en el **estudio 2** (Gamero, González-Anta, Orengo, Zornoza & Peñarroja, 2021; de ahora en adelante "estudio 2") que lleva por título *"**Is Team Emotional Composition Essential for Virtual Team Members' Well-Being? The Role of a Team Emotional Management Intervention**"*.

Basándonos en las teorías del afecto grupal, en este estudio se analiza el efecto de la composición en inteligencia emocional grupal sobre la satisfacción individual con el equipo y los estados afectivos (positivos y negativos) en equipos virtuales. Además, se estudia el rol moderador de la intervención en gestión de emociones antes mencionada. El bienestar de un grupo varía dependiendo del contenido y la interpretación que los miembros hacen de la interacción (Cheshin et al., 2011). Por ello, los recursos individuales (inteligencia emocional) que los miembros aportan puede ser clave para comprender el bienestar en equipos virtuales. Pese a ello, como enunciábamos previamente, el contexto afectivo en el que se opera también puede influir sobre los resultados del equipo en términos de bienestar, y este contexto puede ser modificado mediante intervenciones ad-hoc. En este caso, a través del entrenamiento en gestión emocional del equipo. Asimismo, desarrollamos una aproximación transnivel que nos ayuda a comprender las dinámicas complejas de los equipos virtuales (Gilson et al., 2015), aportando relevantes conclusiones sobre el bienestar hedónico en estos equipos. El estudio resultante se muestra en la figura 2.

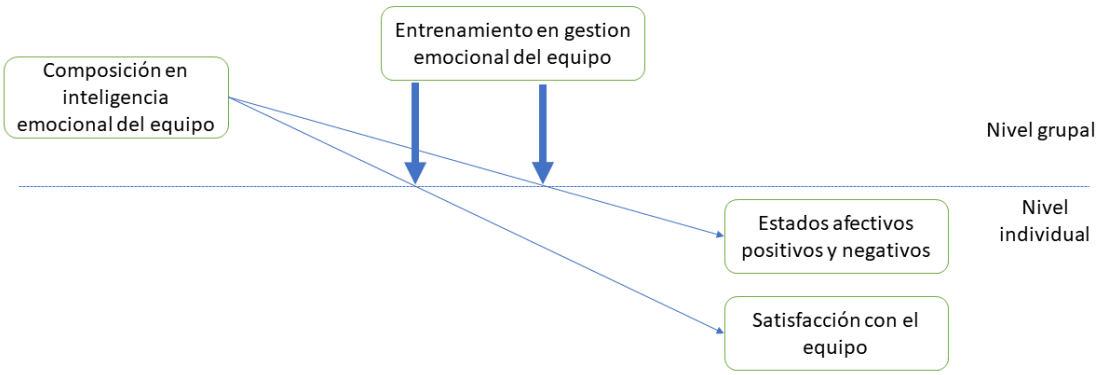

Fig. 2. Modelo teórico estudio 2 (Gamero, González-Anta, Orengo, et al., 2021).

El **objetivo 3** se desarrolla en el **estudio 3** (González-Anta, Orengo, Zornoza, Gamero & Peñarroja, 2020; de ahora en adelante "estudio 3") que lleva por título "***Collaboration and Performance in Virtual Teams with Faultlines: An Emotional Management Intervention***".

En este estudio se analiza el efecto del entrenamiento en gestión emocional del equipo sobre el desempeño de equipos virtuales con subgrupos. Además, se estudia el papel mediador de la "capacidad de colaboración del equipo", un constructo compuesto por la confianza, la comunicación y el compromiso (Batarseh et al., 2017; Blomqvist & Levy, 2006). La capacidad de colaboración cobra relevancia en los equipos virtuales, ya que, tal como explicábamos, estos son particularmente vulnerables a la aparición de subgrupos debido a su dispersión geográfica y potencial composición multidisciplinar (Gilson et al., 2015; Morrison-Smith & Ruiz, 2020). Por ello, la aparición de subgrupos puede afectar a su eficacia, reduce los procesos emocionales y relacionales positivos (*p. ej*. confianza), aumenta las interacciones disfuncionales en el equipo e influye negativamente en el bienestar y el desempeño (Meyer et al., 2014; van der Kamp et al., 2015). En base a ello, consideramos que, si bien la existencia de subgrupos puede ser perjudicial para el desarrollo del equipo y su eficacia; la intervención en gestión emocional mitigará el potencial efecto negativo de los subgrupos. Por ello, hipotetizamos que el entrenamiento en gestión de emociones influirá positivamente en la capacidad de colaboración del equipo, lo que a su vez afectará al desempeño. El modelo resultante puede verse en la figura 3. Debido a las características de la muestra, y siguiendo recomendaciones sobre análisis de mediación y los modelos *IMOI* de funcionamiento y eficacia grupal (Ilgen et al., 2005), se analiza el efecto de la intervención sobre la variables mediadoras –capacidad de colaboración del equipo- y la variable dependiente –desempeño- en momentos temporales distintos, aportando validez a nuestros resultados (Mathieu et al., 2008).

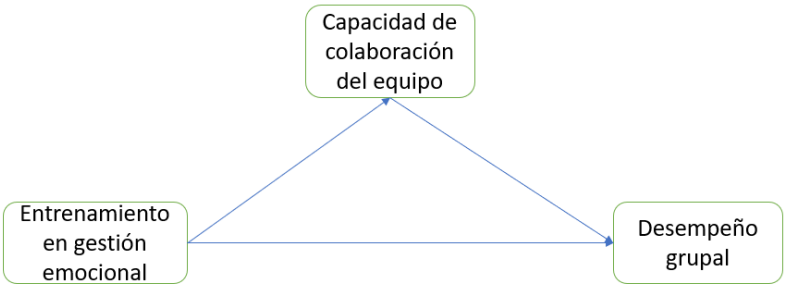

Fig. 3. Modelo teórico estudio 3 (González-Anta et al., 2020).

El **objetivo 4** se desarrolla en el **estudio 4** (González-Anta, Orengo, Zornoza, Peñarroja & Gamero, 2021; de ahora en adelante "estudio 4") que lleva por título ***"Sustainable Virtual Teams: Promoting Well-Being through Affect Management Training and Openness to Experience Configurations"***.

Este estudio parte de la teoría de las demandas y recursos laborales (Demerouti et al., 2001) y la teoría de activación del rasgo (Tett & Burnett, 2003) para explorar el efecto que el entrenamiento en gestión emocional del equipo tiene sobre el engagement grupal como resultado de bienestar en equipos con subgrupos. Considerando que las excesivas demandas del entorno virtual y la falta de recursos pueden perjudicar el bienestar, proponemos que el entrenamiento puede influir positivamente sobre el engagement al proveer a los miembros del equipo con recursos y estrategias que les faciliten la comunicación mediada por ordenador. Además, se estudia el papel moderador de la composición. Específicamente, se analizan distintas configuraciones de apertura a la experiencia, en base al nivel (media) y la heterogeneidad (desviación típica) del rasgo entre los miembros que conforman los equipos estudiados. Basándonos en la teoría de activación del rasgo (Tett & Burnett, 2003), los rasgos de personalidad se pueden manifestar como respuesta a claves situacionales de carácter social. Por ello, consideramos que el efecto del

entrenamiento puede ser modificado por la forma en que la apertura a la experiencia se manifieste en los equipos. Por lo tanto, hay una configuración óptima de este rasgo en equipos virtuales con subgrupos para mejorar los efectos del entrenamiento. El estudio resultante se muestra en la figura 4.

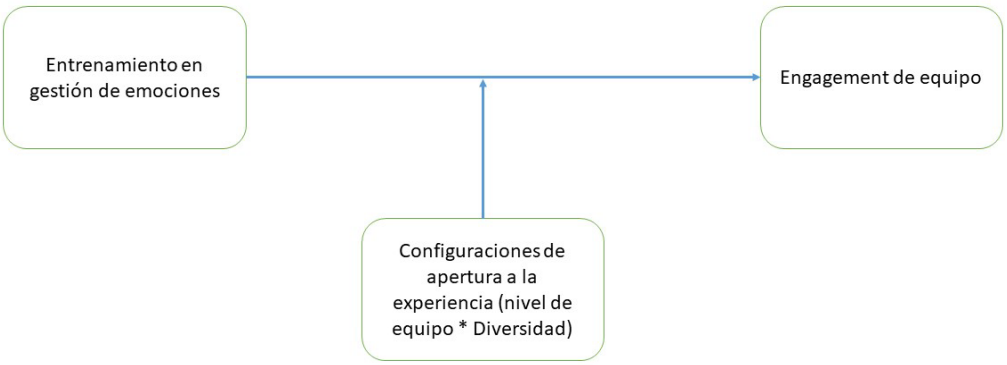

Fig. 4. Modelo teórico estudio 4 (González-Anta, Orengo, Zornoza, Peñarroja, & Gamero, 2021).

METODOLOGÍA

En base a los objetivos propuestos, esta tesis combina dos diseños de investigación en los distintos artículos que componen la tesis. En primer lugar, un *diseño correlacional transversal* con una muestra de comunidades virtuales. Este diseño nos permite estudiar el fenómeno en un contexto real, y es un diseño comúnmente utilizado en estudios de comunidades virtuales (*p. ej.* (J. Kim et al., 2021; Kirkman et al., 2013)). En segundo lugar, *un diseño cuasiexperimental* con una muestra de equipos virtuales en el que implementamos el entrenamiento en gestión emocional del equipo a equipos con y sin subgrupos. Este segundo tipo de diseño facilita estudiar la incidencia que tiene el entrenamiento al contar con medidas pre y posintervención y grupo control. Por ello, es común el uso de diseños de carácter experimental en el estudio de equipos virtuales (*p.ej.* (Martínez-Moreno et al., 2015))

y con subgrupos (*p.ej.* (Chiu & Staples, 2013)). A continuación, se especifican en detalle cada uno de los diseños utilizados.

Para el objetivo 1, en el estudio 1 se utilizó un diseño correlacional transversal. La muestra fue seleccionada mediante muestreo por conveniencia y estuvo formada por 299 participantes de tres tipos de comunidades virtuales, basándonos en la tipología de Henri y Pudelko (2003). En primer lugar, las comunidades de interés se caracterizan por una muy baja interdependencia, intencionalidad y bajo nivel de objetivos comunes. Las comunidades de interés en nuestro estudio (grupos de Facebook o LinkedIn; clubs de lectura online, etc.) representaban un 52,8% de la muestra. El segundo tipo de comunidad fueron las comunidades de aprendizaje, con objetivos comunes centrados en torno a un centro educativo, asignatura, tema didáctico, etc.; con una interdependencia e intencionalidad en un punto medio. En este caso, las comunidades de aprendizaje representaron un 18,1% de la muestra y los miembros pertenecían a una comunidad formada por estudiantes de una universidad a distancia que interactúan a través de un entorno virtual de colaboración. Finalmente, las comunidades virtuales de práctica se caracterizan por una alta intencionalidad y fuertes vínculos entre los miembros, en las cuales los miembros comparten experiencias e ideas para mejorar su práctica profesional (Gannon-Leary & Fontainha, 2007; Henri & Pudelko, 2003). En este estudio, la comunidad de práctica representó el 29,1% de la muestra, y estuvo formada por miembros de un conjunto de organizaciones españolas que trabajan con discapacidad intelectual y problemas del desarrollo e interactúan a través de un entorno virtual de colaboración, centrándose en los retos de su práctica profesional. La información ampliada sobre la metodología de este estudio se encuentra en el artículo 1 del anexo.

Con respecto a ***los objetivos 2, 3 y 4,*** se diseñó y realizó un diseño cuasiexperimental con equipos virtuales, en el cual, a través de un ensayo controlado aleatorizado se puso a prueba el entrenamiento en gestión emocional del equipo. En las secciones posteriores se

especifica la metodología de estos estudios. Además, la información ampliada sobre la metodología se encuentra en las respectivas secciones de los artículos 2,3 y 4 del anexo.

Participantes

La muestra final de participantes fue de 102 equipos virtuales. Además, de éstos, la mitad (52 equipos) tenían subgrupos. Así, este estudio contó con una muestra final de 407 participantes, una vez eliminados casos perdidos, mortandad experimental, etc. La distribución final de los participantes en función de las distintas condiciones experimentales se puede observar en la tabla 1. Cada uno de estos equipos virtuales estuvieron formados por cuatro estudiantes de grado provenientes de asignaturas de Ciencias Sociales de las Universidades de Valencia y Sevilla (España). Por cuestiones éticas y logísticas, la participación de los estudiantes fue voluntaria y se convalidaban las prácticas de la asignatura por la participación en el estudio. La pertenencia a los equipos fue estable durante las sesiones experimentales y los participantes no tenían permitido comunicarse fuera de estas sesiones. El comité ético de la universidad de Valencia aprobó el estudio, y la confidencialidad individual de las respuestas fue garantizada a todos los participantes, que firmaron un consentimiento informado.

	Condición de intervención (entrenamiento en gestión emocional del equipo)	Condición control (equipos *Wait list*)
Con subgrupos	26 EVs	26 EVs
Sin subgrupos	25 EVs	25 EVs

Tabla 1. Muestra final. EV= Equipo Virtual.

Diseño y procedimiento

En este estudio cuasiexperimental se utilizó un diseño 2x2x3 factorial mixto: 2x2 entresujetos (equipos virtuales con subgrupos y sin ellos) x3 intrasujetos (preintervención, posintervención 1 y 2, con aproximadamente una semana de separación entre ellas). Así, en la investigación realizada se usó un ensayo controlado aleatorizado, con medidas pre-post y grupo control para ver si las condiciones creadas tenían efecto sobre los procesos y resultados del equipo. Estos equipos virtuales se conformaban de 4 participantes que operaban en un entorno virtual de colaboración.

En relación con el entorno virtual de colaboración, diseñamos una plataforma virtual interactiva sincrónica de comunicación mediada por ordenador creada específicamente para este estudio. A esta plataforma se accedía a través de un portal web y estaba disponible 24/7, lo que permitía que los miembros pudieran conectarse a las sesiones experimentales y a las sesiones de formación desde cualquier lugar con PC y conexión de internet, emulando las características de un equipo virtual real. De este modo, los participantes podían quedar y trabajar en una sesión en cualquier momento dentro de los rangos prefijados por el diseño experimental y en horarios acordados por el equipo. Este abordaje del diseño fomentó la validez ecológica del experimento y a su vez lo posibilitó, debido a la diferencia de horarios de los distintos miembros de cada equipo. Esta diferencia horaria se dio especialmente en los equipos con subgrupos, en los cuales el equipo se conformaba por miembros con distintos horarios académicos al ser de distintas universidades. Esta posibilidad confiere al experimento un mayor acercamiento a la realidad compleja de los equipos virtuales, ya que por las diferencias en husos horarios de los miembros del equipo en muchas ocasiones se trabaja fuera de horas laborales (Bergiel et al., 2008).

En cuanto a su funcionamiento, esta plataforma permitía realizar las tareas experimentales -emitir videos, actividades, cuestionarios, instrucciones, control de asistencia-. También permitía comunicarse con los administradores si surgían problemas

técnicos, y sobre todo interactuar entre los miembros del equipo a través de un chat de texto con emoticonos y otros recursos comunicativos textuales. Por último, resaltar que esta misma plataforma permitía recibir la formación que constituía la intervención, tanto a nivel individual como grupal.

Para su uso, recibieron instrucciones y formación en una sesión informativa presencial previa al estudio. Además, en esta sesión contestaron un cuestionario de línea base con diversas medidas como la apertura a la experiencia o la inteligencia emocional. Tras esto, los participantes se asignaron aleatoriamente a los equipos virtuales y los equipos se asignaron aleatoriamente a la condición control (grupos "en espera", también conocido como *wait list*) o experimental (grupos que recibían la intervención).

Como hemos comentado, había una segunda condición experimental que consistía en la creación de subgrupos. 52 equipos presentaban subgrupos y 50 no los tenían. Para crear esta condición, todos los participantes contestaron un cuestionario en la sesión informativa que posteriormente se utilizó para asignar una característica ficticia de personalidad y gustos denominada "perfil aventurero". Este perfil aventurero podía ser "intrépido" (gustos orientados al riesgo como deportes de alta intensidad, búsqueda de sensaciones, etc.) o "reflexivo" (gustos orientados a actividades pausadas). Junto con este perfil, se combinaba la universidad de procedencia (Valencia o Sevilla), creando equipos con dos miembros de igual perfil y universidad; y los otros dos de perfil y universidad contrarias. Es decir, se generó una brecha para fragmentar cada equipo en subgrupos en base a dos características de diversidad que se alineaban (Gibson et al., 2014). Además, se potenciaron las brechas a través de diversos métodos como actividades de calentamiento (*p. ej.* (Rico et al., 2012)) e iconos representativos para activar la brecha en caso de que no se hubiera hecho explícita (lo que se ha denominado brecha durmiente). Asimismo, se verificó que estos subgrupos habían sido correctamente generados y percibidos por los miembros mediante cuestionarios específicos de identificación con el subgrupo (*i.e., manipulation check)*.

Los equipos virtuales en la condición experimental realizaban una tarea experimental (sesión preintervención), luego recibían el entrenamiento y tras esto realizaban las sesiones experimentales 2 y 3 (sesiones posintervención). Por otro lado, los equipos en la condición control realizaban las 3 sesiones experimentales y recibían el entrenamiento al final debido a las implicaciones éticas que habría tenido no ofrecérselo. Pese a ello, sólo se usaron los datos de las 3 sesiones experimentales en la condición control. Estas sesiones se separaban aproximadamente 1 semana entre ellas. Así, incluyendo el entrenamiento que explicamos en los siguientes párrafos, el estudio duraba aproximadamente 5 semanas. En la figura 5 se muestra gráficamente el diseño para facilitar su comprensión.

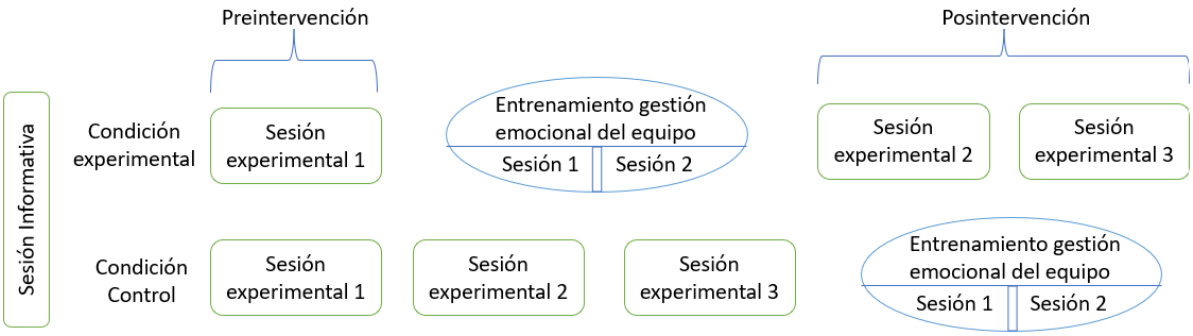

Fig. 5. Diseño experimental

Tareas experimentales

Durante las 3 sesiones experimentales, los equipos realizaban tareas intelectivas de toma de decisiones (McGrath, 1984), específicamente lo que se conoce como tareas de supervivencia en las cuales los participantes son expuestos a una situación de riesgo y han de ordenar una serie de objetos en base a su importancia para solventar la situación. Así, estas tareas facilitan la interacción pues requieren combinar las intuiciones y cogniciones individuales y analizar la situación juntos de cara a razonar el orden óptimo de los objetos para sobrevivir. Con el objetivo de hacer el experimento más sencillo y motivador para los sujetos experimentales, se aplicó *storytelling* digital, es decir, se articularon las tres tareas de supervivencia en una narrativa compartida, de tal modo que, conforme realizaban las

tareas experimentales iban avanzando en una historia. Se utilizaron tres tareas traducidas y adaptadas: el incendio forestal (Human Synergistics, 2018); el ejercicio del refugio nuclear (D. W. Johnson & Johnson, 1994), cambiando su contexto a un bunker; y el problema de supervivencia del desierto ("perdidos en el desierto") (Lafferty et al., 1974).

Intervención: entrenamiento en gestión emocional del equipo

Por último, el entrenamiento en gestión emocional del equipo consistió en dos bloques formativos, cada uno de los cuales tenía una sesión de trabajo individual y una sesión colectiva. Estos bloques se realizaban entre la preintervención y la posintervención en la condición experimental.

Durante las sesiones individuales, los participantes aprendieron los contenidos formativos mediante material audiovisual y lo practicaron a través de una serie de ejercicios. Tras ello, en las sesiones colectivas, el equipo trabajó en línea de manera sincrónica y practicó en grupo tratando de acordar cómo incluir el contenido de la formación durante las siguientes sesiones de trabajo (sesiones post).

Los contenidos de la formación pueden verse resumidos en la tabla 2, en la cual se indican también las bases teórico-empíricas para su elaboración.

<table>
<tr><td colspan="3"><u>Intervención: entrenamiento online en gestión emocional del equipo virtual</u>
Principios de la teoría SIP (Walther, 1992) y teorías del afecto grupal y la gestión afectiva ((George, 1990; Kelly & Barsade, 2001); ver Barsade & Knight, 2015; Gamero & González-Romá 2020 para una revisión)</td></tr>
<tr><td>Bloque 1</td><td>Identificar, expresar, regular y compartir emociones en equipos virtuales a través de recursos comunicativos ((Cuadrado et al., 2015; Derks et al., 2008; Glikson & Erez, 2013; Kalman & Gergle, 2014; Kalman & Rafaeli, 2011; Skovholt et al., 2014) entre otros)</td><td>Bloque 2
Cómo gestionar y regular el clima emocional del equipo en equipos virtuales a través de 5 estrategias ((Ayoko et al., 2012; Choi et al., 2015; Druskat & Wolff, 2001; Marks et al., 2001) entre otros)</td></tr>
<tr><td colspan="2">- Uso de claves paralingüísticas (uso de mayúsculas, modismos, onomatopeyas, sustitutos léxicos y vocales, espaciado entre palabras)</td><td>- Apreciar y agradecer el esfuerzo y las aportaciones del resto de miembros
- Recompensas de éxito y esfuerzo grupal</td></tr>
<tr><td colspan="2">- Manejo de las claves temporales (interpretación y uso de las pausas y los silencios, comprensión del tiempo en comunicación mediada por ordenador)</td><td>- Alentar a los compañeros para motivarlos hacia la consecución de la meta grupal
- Bromear, utilizar el humor</td></tr>
<tr><td colspan="2">- Manejo de emoticonos (uso e interpretación para apoyar un mensaje escrito, suavizarlo o enfatizarlo)</td><td>- Reevaluar las situaciones negativas</td></tr>
</table>

Tabla 2. Resumen del contenido del entrenamiento en gestión emocional del equipo (bases teórico-empíricas).

RESULTADOS PRINCIPALES

En primer lugar, los resultados del **estudio 1** muestran un efecto indirecto parcial del sentido de comunidad virtual en la intención de continuar participando a través del compromiso, mecanismo mediador de la relación entre estas dos variables en comunidades virtuales. Además, se observa un efecto modulador del tipo de comunidad virtual. Específicamente, el efecto indirecto ha sido mayor en comunidades virtuales de aprendizaje y comunidades virtuales de interés que en comunidades de práctica, no habiendo diferencias significativas entre las comunidades de aprendizaje y las comunidades de interés.

En segundo lugar, los resultados del **estudio 2** muestran que la composición en inteligencia emocional influye positivamente en la satisfacción individual con el equipo y negativamente en el afecto negativo, no teniendo efecto significativo sobre el afecto positivo. Por su parte, el entrenamiento en gestión emocional del equipo modula parcialmente los resultados. Concretamente, los equipos que habían sido entrenados no muestran un efecto positivo y significativo de la composición sobre la satisfacción con el equipo. Además, el efecto negativo de la composición sobre el afecto negativo también deja de ser significativo.

En tercer lugar, los resultados del **estudio 3** muestran que no hay un efecto positivo directo y significativo del entrenamiento sobre el desempeño en equipos con subgrupos. Sin embargo, sí hay un efecto indirecto del entrenamiento en el desempeño a través de su influencia en la confianza y el compromiso. Además, las tres variables que se engloban en la capacidad de colaboración del equipo -confianza, compromiso y comunicación- tienen un efecto positivo sobre el desempeño.

Por último, los resultados del **estudio 4** muestran, primero un efecto positivo del entrenamiento en gestión emocional para incrementar el engagement grupal en equipos con subgrupos. En segundo lugar, se confirma el rol moderador de la composición en personalidad. Las distintas configuraciones de personalidad en equipos virtuales en base al nivel y la heterogeneidad de la apertura a la experiencia modifican el efecto del

entrenamiento. Específicamente son los equipos con alto nivel de apertura y baja diversidad los que se ven más beneficiados por el entrenamiento.

CONCLUSIONES Y PRINCIPALES APORTACIONES

Los entornos virtuales de colaboración llevan dos décadas ganando protagonismo en el ámbito laboral y personal. Las tecnologías de la comunicación y la información han beneficiado al conjunto de la sociedad, proveyéndonos de formas de optimizar los procesos de trabajo e interacción. Gracias a ello, se han podido superar barreras de distinta índole y mejorar los resultados laborales y personales ya no solo a nivel individual, sino también de grupos de individuos dispersos que interaccionan parcial o totalmente a través de tecnología (Cascio & Montealegre, 2016; Harari, 2018). Recientemente, a raíz de la pandemia de COVID-19 el crecimiento de los entornos virtuales de colaboración (*p. ej.* equipos virtuales) ha sido exponencial, pasando de una implantación relativamente modesta en algunos casos a la práctica totalidad de su uso en algunas organizaciones (Newman & Ford, 2021). Esto ha favorecido que haya una creciente aceptación del uso de entornos virtuales de colaboración. En esta línea, un reciente informe muestra que un 63% de las compañías de gran crecimiento ya permiten modelos de trabajo en remoto, y un 83% de los encuestados consideran óptimo el trabajar, al menos parcialmente, mediante entornos virtuales de colaboración (Accenture, 2021). Este hecho, que se enmarca en la "cuarta revolución industrial" (Schwab, 2017), nos plantea como investigadores la necesidad apremiante de comprender el impacto que tiene el uso de los entornos virtuales de colaboración en el mundo que nos rodea. Pero, además, nos obliga a buscar formas de guiar su implantación, su funcionamiento y de maximizar su eficacia, reduciendo sus riesgos. Así, tenemos la oportunidad de mirar más allá de los entornos virtuales de colaboración como simples herramientas cuyo éxito o fracaso nos es ajeno. Podemos tener un impacto en las personas, las comunidades y las organizaciones influenciando y optimizando el uso de estos sistemas que *nos* rodean y moldean nuestro día a día (Schwab & Davis, 2018).

En base a este planteamiento, la presente tesis ha tratado de hacer una aportación significativa al campo de la Psicología y a la sociedad. Para este fin, hemos trabajado en la comprensión y la mejora del bienestar y la eficacia de los entornos virtuales de colaboración, primeramente, a través de su estudio, y en segundo lugar, mediante el diseño y puesta a prueba de un entrenamiento en gestión emocional del equipo. A continuación, se enumeran las conclusiones de los estudios y las que se extraen del conjunto de la tesis.

En primer lugar, en el **estudio 1** se investigó la eficacia, y particularmente la sostenibilidad o viabilidad de las comunidades virtuales. Partiendo del modelo SIDE, la desinvidualización y el potencial anonimato que se da en las comunidades virtuales plantea retos para su óptima sostenibilidad. Por ello, se estudió el sentido de comunidad y el compromiso como antecedentes de la intención de participar de los miembros. A raíz de los resultados, podemos concluir que, tal como esperábamos, el sentido de comunidad virtual es importante para la viabilidad de la comunidad, pero también el compromiso de los miembros hace que la participación se mantenga. Así, para fomentar las comunidades virtuales sostenibles es importante atender a cómo los miembros se identifican y sienten con respecto a la comunidad, pero también a qué acciones específicas llevan a cabo para esforzarse en apoyar su funcionamiento -es decir, su compromiso-. Además, coincidimos con la literatura previa (*p. ej.* (Chang et al., 2016; Meirinhos & Osório, 2009)) en destacar la importancia de explorar diferentes tipos de comunidades virtuales. Los resultados mostraron que el efecto indirecto a través del compromiso fue menor en las comunidades virtuales de práctica que en las comunidades de interés y de aprendizaje. Estos resultados nos llevan a reflexionar sobre el rol del sentido de comunidad en las comunidades de práctica. Es posible que, tal como apuntan algunos estudios (*p. ej*. (Gannon-Leary & Fontainha, 2007)), estas comunidades se desarrollen más orgánicamente y sean menos transitorias. Por tanto, los sentimientos de pertenencia e identificación con la comunidad cobren un papel determinante, motivando intrínsecamente a los miembros a participar activamente. Por otro

lado, la participación en comunidades de interés y de aprendizaje se caracterizaría más por intereses particulares (por ejemplo, participantes que quieren adquirir un rol central por su interés en el tema, o por una calificación académica) y la potencial limitación temporal de algunas de estas comunidades. Por tanto, el compromiso cobra en estos casos un papel más activo. No obstante, estas conclusiones se han de enmarcar en las limitaciones del estudio, y particularmente el uso de un diseño correlacional, que no permite extraer conclusiones de causalidad, a pesar del soporte que da la literatura previa en relación con la dirección de las relaciones hipotetizadas. En cualquier caso, estos resultados sugieren seguir explorando las comunidades virtuales atendiendo a las diferencias entre comunidades y a procesos grupales centrados en la naturaleza de la relación como el compromiso y el sentido de comunidad (i.e. pertenencia, identidad y afiliación), con el fin de lograr su sostenibilidad.

En segundo lugar, en el **estudio 2** se cambió el entorno virtual de colaboración y se investigó el bienestar en equipos virtuales. Concretamente, los resultados mostraron que en equipos virtuales la composición en inteligencia emocional afectaba positivamente a la satisfacción individual con el equipo y negativamente al afecto negativo, y el entrenamiento en gestión de emociones moderaba estos resultados. Tomando como referencia la aproximación del afecto grupal (Barsade & Gibson, 1998; Barsade & Knight, 2015), consideramos que para que haya un adecuado bienestar de equipo es importante entender que el afecto nace como una combinación de factores individuales que los miembros tienen y factores contextuales que suceden durante la interacción del equipo, como es en este caso el entrenamiento en gestión emocional del equipo. Además, nos apoyamos en la Teoría del Procesamiento de la Información Social (Walther, 1992) para configurar este entrenamiento, considerando la necesidad de que los miembros del equipo aprendan a transmitir información afectiva a través de medios textuales, así como a gestionar el clima afectivo grupal, a pesar de los retos de trabajar en un entorno virtual de colaboración. A raíz de los

resultados obtenidos se destaca que, efectivamente, los modelos de composición son importantes para comprender el bienestar en equipos virtuales, con particular interés en el papel de las características afectivas individuales. Además, los resultados ponen de manifiesto que independientemente de los atributos individuales, el entrenamiento en gestión de emociones puede modificar el bienestar, si bien es importante atender a qué variables o resultados queremos modificar a la hora de implementar un entrenamiento, ya que por ejemplo en el caso de equipos con alto nivel de inteligencia emocional, el entrenamiento no tendría un papel relevante. Por lo tanto, podemos concluir que la composición de un equipo en inteligencia emocional es una característica a tener en cuenta cuando se creen equipos virtuales, pero en el caso de que los niveles no sean óptimos, el entrenamiento en gestión emocional es un recurso clave que nos puede ayudar a mejorar el bienestar hedónico. Así, considerando el rol de la composición en inteligencia emocional y el efecto del entrenamiento, será posible fomentar equipos virtuales cuyos miembros sean más felices.

En tercer lugar, los estudios 3 y 4 exploraron el efecto del entrenamiento en gestión emocional sobre los resultados de eficacia y bienestar de equipos virtuales con subgrupos.

En concreto, en el **estudio 3** se investigó la eficacia en equipos virtuales, particularmente el desempeño del equipo. Los resultados mostraron que el entrenamiento en gestión emocional del equipo tiene un efecto positivo indirecto sobre el desempeño a través de la confianza y el compromiso. Estas dos variables, junto con la comunicación, se engloban en lo que Blomqvist y Levi (2006) identificaron como las variables clave que definían la capacidad de colaboración del equipo. La capacidad de colaboración del equipo implica por tanto un conjunto de componentes o procesos que se pueden dar en el equipo y benefician sus resultados mediante la mejora de la colaboración entre los miembros. Este marco es de vital importancia en equipos virtuales con diversidad de los miembros (Batarseh et al., 2017). Así, los resultados apuntan a la importancia de los mecanismos indirectos en la eficacia del

entrenamiento. Los equipos virtuales, especialmente si tienen subgrupos, operan en un entorno altamente incierto y complejo (Blomqvist & Levy, 2006; Gilson et al., 2015). Por ello, la forma en que el equipo gestiona el afecto y es capaz de transmitir emociones más allá de las dificultades y la diversidad, influye en cómo el equipo colabora -sus procesos de confianza y compromiso-. Esto, a su vez, afecta al desempeño percibido por el equipo. Es decir, el entrenamiento en gestión de emociones es positivo para favorecer que los equipos virtuales desarrollen competencias que, gracias a su influencia en los procesos colaborativos del equipo, les hagan más productivos.

Por último, en el **estudio 4** se investigó el bienestar en equipos desde una perspectiva eudaimónica y específicamente, se exploró el engagement de equipo como un resultado clave de bienestar. Los resultados mostraron que el entrenamiento en gestión emocional del equipo tuvo un efecto positivo en el engagement grupal, y además, la forma en que la apertura a la experiencia se configurara en el equipo (nivel y diversidad) podía modificar estos resultados. En concreto, se puso de manifiesto la existencia de un patrón óptimo de apertura que hace que el entrenamiento sea más efectivo en aquellos equipos con alto nivel de apertura a la experiencia y una mínima diversidad. Basándonos en la Teoría de las Demandas y Recursos laborales (Bakker & Demerouti, 2017; Demerouti et al., 2001), planteamos que trabajar en equipos virtuales que además tienen brechas de diversidad implica un aumento de las demandas que, ante la falta de recursos, puede perjudicar el engagement del equipo. A raíz de los resultados podemos concluir que, para amortiguar este efecto, el entrenamiento facilita el incremento de recursos para gestionar el afecto. En consecuencia, logramos hacer que los participantes muestren más interés en la tarea, en sus requerimientos, le dediquen más tiempo y esfuerzo gracias al mejor clima emocional, en definitiva, que mejoren su engagement. Junto a esto, basándonos en una aproximación configuracional contingente (Moynihan & Peterson, 2001) y la Teoría de Activación del Rasgo (Tett & Burnett, 2003), tratamos de aportar resultados orientados a la búsqueda de

consenso en relación con el papel de la apertura a la experiencia. La personalidad en equipos virtuales sigue siendo un área poco explorada en la literatura, especialmente como en este estudio, combinada con variables de composición superficiales como la diversidad demográfica. Así, estos resultados concurren parcialmente con los del estudio 2 y muestran que las características de composición juegan un papel relevante para comprender el bienestar, en este caso, eudaimónico. Además, apuntan a la utilidad del entrenamiento para mejorar el engagement de equipo. En este caso se observa un efecto positivo del entrenamiento que apunta a que podemos hacer a los equipos virtuales más sostenibles mediante el entrenamiento en gestión de emociones y atendiendo, de nuevo a factores de composición.

En suma, con la presente tesis doctoral se **contribuye de manera teórica** a la comprensión del bienestar y de la eficacia en diversos entornos virtuales de colaboración (comunidades virtuales de distinto tipo, equipos virtuales con y sin subgrupos). Para ello, hemos utilizado y hecho aportaciones a diversos marcos teóricos vinculados a la tecnología y la comunicación mediada por ordenador; los grupos y su composición; así como a las intervenciones desarrolladas en el marco de la Psicología Organizacional. Hemos puesto un particular énfasis en la teoría SIP y las teorías del afecto, considerando que los retos de la tecnología y la comunicación mediada por ordenador pueden ser abordados mediante la mejora de la gestión afectiva. A tal efecto, hemos diseñado y testado un entrenamiento en gestión emocional de equipo en el cual se entrenó a los miembros para proveerles de distintos recursos comunicativos y estrategias de gestión del afecto grupal en un contexto de comunicación mediada por ordenador. Este entrenamiento añade más evidencia al corpus de literatura que muestra la utilidad y eficacia de las intervenciones de equipo para mejorar los resultados grupales (Bowers et al., 2000; Lacerenza et al., 2018), particularmente en relación con la adaptación a la tecnología (Parker & Grote, 2020). Además, responde a la necesidad de comprender y mejorar el afecto grupal y su gestión (Druskat & Wolff, 2001;

Marks et al., 2001), especialmente en entornos virtuales de colaboración (Gamero & González-Romá, 2020; García-Buades et al., 2020) mediante intervenciones grupales (Druskat & Wolff, 2001). Junto a esto, nuestros resultados se suman a la literatura que apoya la relevancia de los procesos colaborativos en equipos virtuales (Batarseh et al., 2017, 2018), y plantea la posibilidad de diferenciar entre los procesos que se engloban en la capacidad de colaboración del equipo, así como explorar nuevas variables a incluir. Asimismo, los resultados también contribuyen teóricamente al uso de la teoría de la activación del rasgo en entornos virtuales de colaboración y a la importancia de atender a las diferentes perspectivas de las configuraciones grupales. En concreto, los resultados ponen de manifiesto la importancia de atender a cómo se manifiesta y configura la personalidad en el equipo y aportan nuevas ideas sobre cómo diferentes patrones de apertura a la experiencia pueden fomentar la creación de equipos virtuales sostenibles. Por otro lado, hacemos una contribución en el campo de las comunidades virtuales, ya que muchos estudios han explorado su funcionamiento y resultados a través del estudio de un tipo particular de comunidad (*p. ej.* (Chang et al., 2016; Frison & Eggermont, 2016)) pero sigue existiendo la necesidad de estudiar los aspectos relacionales en las comunidades virtuales desde una perspectiva comparativa, considerando cómo el tipo de comunidad influye en los resultados.

Pese a estas aportaciones, existen algunas **limitaciones** que establecen puntos de partida y nuevas vías de investigación que cabe mencionar, más allá de las limitaciones particulares de cada estudio. En primer lugar, esta tesis explora el bienestar y la eficacia en entornos virtuales de colaboración de distinto tipo, pero no lo hace de manera combinada. Sin embargo, existe una importante área inexplorada en relación con las intersecciones entre equipos y comunidades virtuales. Una propuesta de partida sería investigar equipos virtuales integrados dentro de comunidades virtuales. Además, el estudio de otros tipos de entornos virtuales arrojaría también luz sobre esta pregunta de investigación. Por ejemplo, los sistemas multiequipo son generalmente referidos por la literatura, pero su investigación está

todavía en un estadio inicial (Salas et al., 2018; Turner et al., 2020). Por otra parte, el estudio de equipos virtuales en esta tesis se hace mediante un estudio controlado aleatorizado a través de comunicación mediada por ordenador. Este diseño cuasiexperimental con tres tiempos de medida contribuye a la solidez de las conclusiones y a apuntar, en parte, a mecanismos de causalidad. Además, aumenta la validez ecológica al simular parcialmente un contexto real de colaboración virtual. Sin embargo, se limita parcialmente nuestra capacidad para controlar todas las posibles variables extrañas. Además, gracias a los avances en la tecnología y la realidad laboral, cada vez será más común que se considere la virtualidad como una característica de los equipos (Alves et al., 2022; Handke et al., 2021). Por lo tanto, el foco de estudio se moverá hacia los equipos "blended" o híbridos (Klonek et al., 2021), donde la expectativa es la de trabajar parcialmente a través de entornos virtuales y parcialmente de manera presencial (Accenture, 2021; Alves et al., 2022). En este contexto híbrido será necesario explorar de nuevo el rol del afecto grupal y la expresión emocional (Alves et al., 2022).

Considerando las conclusiones, y a pesar de las limitaciones y alcance de nuestros estudios, también se pueden extraer **implicaciones prácticas** para su uso en el ámbito de la psicología aplicada**.** La gestión de equipos y comunidades virtuales presenta diversos retos para las organizaciones que los utilizan y se benefician del uso de entornos virtuales de colaboración.

En primer lugar, para conseguir comunidades virtuales que sean sostenibles es importante retener a los miembros y fomentar su participación. Para tal fin, los gestores de comunidades virtuales deben diseñar las comunidades y las interacciones con los miembros de manera que fomenten sus sentimientos de membresía, identificación y pertenencia. Por ejemplo, es importante crear espacios que permitan desarrollar identidades online, que faciliten la interacción y creen un entorno cálido para sus participantes. Junto a esto, es importante fomentar la participación de las personas que muestren conductas de

compromiso con la comunidad, como una mayor y más significativa participación. Este elemento será especialmente importante según el tipo de comunidad. Así, mientras que en las comunidades de práctica el sentido de pertenencia e identidad son clave para la participación, en las comunidades de aprendizaje y de interés el compromiso de los miembros tiene un papel más relevante.

En segundo lugar, para conseguir equipos virtuales que funcionen y sean sostenibles es necesario, en primer lugar, atender a las características de sus miembros. Los gestores de equipos virtuales podrían crear equipos atendiendo al riesgo de las brechas de diversidad, y evitando por tanto que se alineen características demográficas que podrían provocar subgrupos. Además, a la hora de seleccionar los participantes de estos equipos, será más beneficioso para su bienestar si estos tienen altos niveles de apertura a la experiencia e inteligencia emocional. Sin embargo, la selección de sus miembros en base a características demográficas o psicológicas no siempre es posible, pues suelen primar criterios económicos y/o funcionales (*p. ej.* equipos virtuales de miembros de una misma empresa con distintas sedes). Además, aun teniendo una composición óptima, muchos equipos necesitan desarrollar competencias para un adecuado trabajo en equipo (Lacerenza et al., 2018; Salas, 2015), especialmente vinculadas a la competencia digital. Esto puede suponer una demanda añadida al puesto y causar diversos efectos negativos, al menos a corto plazo (Demerouti, 2020).

Considerando lo previamente expuesto, es importante que las organizaciones inviertan recursos en intervenciones y formación (Parker & Grote, 2020). Específicamente, será positivo el desarrollar competencias emocionales con las que afrontar los potenciales retos de la composición y la tecnología. Gracias al entrenamiento propuesto los miembros mejoran sus habilidades para expresar emociones, interaccionar, expresarse, entender a sus compañeros y gestionar el clima emocional incluso si existen dificultades para transmitir sus emociones y relacionarse, como en un intercambio en un chat o a través de emails. Además,

este entrenamiento cuenta con la ventaja añadida de ser diseñado en un formato pensado para su implementación online y de corta duración (dos bloques en dos sesiones formativas), como se ha hecho en los estudios de esta tesis. Es decir, es una aportación útil al ámbito de la formación online. De este modo, se facilita su uso en el contexto laboral, pues los trabajadores pueden acceder a él desde cualquier lugar con conexión a internet y supone una mínima inversión de tiempo que apenas interrumpe su jornada laboral. Gracias al entrenamiento se mejoran los resultados de equipo, y también los procesos colaborativos que se dan en el mismo, específicamente la confianza y el compromiso de los miembros. Por ello, la implementación de este entrenamiento está recomendado no sólo por sus resultados positivos, sino por la mejora del funcionamiento del equipo.

En definitiva, los resultados obtenidos en la presente tesis doctoral nos permiten concluir que los entornos virtuales de colaboración aportan beneficios a las organizaciones y a los individuos, pero no están exentas de retos fruto de las limitaciones de la tecnología y la forma de interaccionar en estos entornos. Por ello, es importante comprender y optimizar su funcionamiento con el fin de mejorar los resultados de los distintos agentes implicados. Los estudios realizados ponen de manifiesto que para comprender el bienestar y la eficacia en estos entornos es importante tener en cuenta las características de sus miembros, el tipo de estructura y los procesos y aspectos relacionales del grupo. Asimismo, para mejorar el bienestar y la eficacia, se ha propuesto un entrenamiento breve online en gestión emocional del equipo que, mediante su interacción con diversos factores, ha permitido fomentar entornos virtuales de colaboración felices, sostenibles y productivos.

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ANEXO

ESTUDIO 1: Understanding the Sense of Community and Continuance Intention in Virtual Communities: The Role of Commitment and Type of Community

González-Anta, B., Orengo, V., Zornoza, A., Peñarroja, V., & Martínez-Tur, V. (2021). Understanding the Sense of Community and Continuance Intention in Virtual Communities: The Role of Commitment and Type of Community. *Social Science Computer Review*, *39*(3), 335–352. https://doi.org/10.1177/0894439319859590

Understanding the Sense of Community and Continuance Intention in Virtual Communities: The Role of Commitment and Type of Community

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Abstract

Virtual communities (VCs) have become essential in current organizations and society, and so their sustainability is a topic of interest for researchers and practitioners. We focus on the sense of virtual community (SoVC) and commitment as relevant antecedents in achieving the success and maintenance of different types of VCs (communities of interest, virtual learning communities, and VCs of practice). Specifically, this study examines a moderated mediation model in which the type of VC moderates the indirect effect of a SoVC on the intention to continue through the perceived commitment of the users of the VC. The sample consists of 299 members of VCs. The results showed that SoVC influenced the intention to continue via commitment to VCs. Additionally, the relationship between SoVC and commitment was higher for communities of interest and virtual learning communities than for VCs of practice. This article contributes to previous literature by identifying the importance of participants' engagement and the contingent effect of the type of community. Implications of the study and directions for future research are discussed.

Keywords
virtual community participation, intention to continue, virtual learning communities, virtual communities of practice, communities of interest, sense of virtual community, commitment

The technological developments achieved recently are changing the way of interacting online, sharing information, creating knowledge, and managing work (Martínez-López, Anaya-Sánchez, Aguilar-Illescas, & Molinillo, 2016). These technologies have greatly fostered the development of *virtual communities* (VCs): Online social aggregations created

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through mutual interactions (Li & Lee, 2013; Martínez-López et al., 2016), in which individuals interact around a shared interest in larger numbers than on virtual teams (Blanchard, Wellbourne, & Boughton, 2011; Ferran-Urdaneta, 1999; Ridings et al., 2002). Communications and relations among participants are at least partially supported and mediated by technology, they are guided by norms or protocols, and they last for a certain period of time (Kozinets, 1999; Porter, 2004).

In a similar way to off-line communities, participants in VCs "gather" together, generate social ties, and create online identities with trusted groups (Chiu, Hsu, & Wang, 2006) that can develop common projects together and transmit practical experience easily (Luo, Zhang, & Zhang, 2019; Majewski, Usoro, & Khan, 2011). Consequently, VCs are an effective tool for the development of organizations and society (e.g., Gable, 2015; Slavich & Zimbardo, 2012; Zhang, Johnson, Seltzer, & Bichard, 2010). However, the success of VCs rests on a participative scheme: Their members' contributions are necessary for their long-term viability (Bateman, Gray, & Butler, 2011; Bhattacherjee, 2001; Bhattacherjee & Lin, 2015). Therefore, researchers and practitioners have previously tried to understand the variables that facilitate the sustainability of VCs, and they recommend continuing to disentangle these elements (Chen, 2007; Cheung, Lee, & Lee, 2013; Fang & Zhang, 2019).

Intention to continue is one of the key variables in understanding the sustainability and success of VCs because it is a driver of behavior and has become an emerging area in academic research (Bhattacherjee & Lin, 2015; Luo et al., 2019; Nabavi Taghavi-Fard, Hanafizadeh, & Taghva, 2016). In this study, we aim to expand this field of research by analyzing how SoVC affects members' intention to continue to participate in VCs. According to past research, SoVC is one of the main elements that fosters participation in VCs (Blanchard & Markus, 2004; Blanchard, 2008; Chen, Yang, & Tang, 2013; Luo, Zhang, & Qi, 2017). Members of a VC will continue to participate to the extent that they feel part of the community, building an online identity and establishing emotional bonds with the rest of the participants (Abfalter, Zaglia, & Mueller, 2012; Luo et al., 2017). However, a lack of social

ties and personal information can mean that this identity does not develop in the same way in a virtual context and, thus, is still fragile (social identity model of deindividuation effects [SIDE]; Reicher, Spears, & Postmes, 1995; Spears, Lea, & Lee, 1990). In this regard, users are required to make an additional effort in order to reinforce and consolidate SoVC and facilitate the collective behavior and sustainability of the VC. Hence, commitment has been shown to mediate the effect of SoVC on various forms of participation in VCs, such as knowledge sharing and student persistence (Chang, Hsieh, & Fu, 2016; Laux, Luse, & Mennecke, 2016), and so we expect it to mediate the effects of SoVC on intention to continue.

Additionally, the mediating mechanism proposed could vary depending on the type of VC studied. Different types of VC have different objectives, characteristics, and dynamics (Abouzahra & Tan, 2014; Blanchard & Markus, 2004; Dholakia, Bagozzi, & Pearo, 2004). Although there is no consensus about the existing types of VCs or a ubiquitous typology (Porter, 2004), Henri and Pudelko's (2003) VC typology can be useful to distinguish several types of VCs depending on their characteristics. Hence, based on the Henri and Pudelko (2003) typology, we examine whether the type of VC moderates the mediating effect of SoVC on the intention to continue through commitment. In this study, we analyze three types of VCs: Communities of interest are VCs of individuals who gather around a common interest; virtual learning communities are VCs of students focused on an academic topic; and virtual communities of practice (VCoP) are VCs addressed to professionals who discuss topics related to their jobs or fields of knowledge.

In sum, we study the mediating effect of commitment and the moderating effect of the type of VC on the link between SoVC and intention to continue. This article helps to expand the scarce research available on the mechanisms for fostering participation in different types of VCs, based on SoVC and commitment. We also address the implications of our results for community facilitators and managers, providing useful advice about fomenting participation, considering the nuances of each type of VC. The research model for this study is depicted in Figure 1.

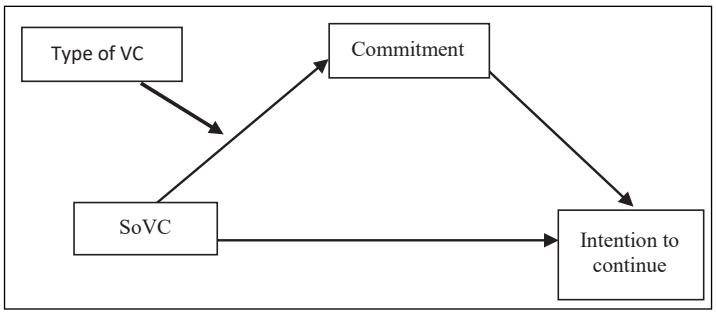

Figure 1. Theoretical model.

SoVC and Intention to Continue: The Mediating Effect of Commitment

SoVC is defined as "an individual's feelings of membership, identity, belonging and attachment to a group that interacts primarily through electronic communication" (Blanchard, 2007, p. 827). As in off-line communities, users try to establish their own identity as well as the identity of others. Thus, the interaction with other participants in the community and the interdependence produced creates awareness of the self as part of the community (Ho & Lin, 2016). Moreover, participants become members who create an online identity and seek out information about others' identities in a reification process that fosters the appearance of common identities (Blanchard et al., 2011; Tonteri, Kosonen, Ellonen, & Tarkiainen, 2011). Overall, the intention to continue would greatly increase if participants were able to foster the exchange of support and positive feelings of involvement in the community (Blanchard & Markus, 2004; Ellemers, Kortekaas, & Ouwerkerk, 1999; Rovai, 2002).

However, identity may develop differently in virtual teams from conventional ones. According to the SIDE model (Reicher et al., 1995; Spears et al., 1990), the anonymity of the virtual context, due to a lack of personal information (e.g., nicknames, avatars, usernames, and countless user accounts), triggers a deindividuation process that allows the emergence or salience of the collective identity to the detriment of the personal one (Kim & Park, 2011). Nevertheless, this collective identity is still fragile and needs to be cultivated (Zhao, Stylianou, & Zheng, 2013). In virtual contexts, it is difficult to achieve a shared emotional connection

(Abfalter et al., 2012). Even though a high level of perception of SoVC could provide the users with accessibility and resource exchanges, there is no guarantee that this perception will result in effective and continuous participation in the long term (Gangi & Wasko, 2009). This discrepancy occurs, for example, in large VCs—for example, World Economic Forum Book Club—with few people posting and several lurkers who feel part of the community even though they are not participating.

In this context, relational aspects such as commitment to the community can become a mechanism that transmits the social identity (Gangi & Wasko, 2009; Kim, Eisenberger, & Baik, 2016; Lee, Park, & Koo, 2015; Zao et al., 2013) in order to contribute to the VC and make it sustainable. In fact, as in off-line communities, the intention to continue in VCs could also depend on the members' commitment (Koh & Kim, 2003). Although SoVC is an important variable in the intention to continue, several authors have also mentioned the effect of commitment on the intention to continue, considered through different constructs (Gharib, Philpott, & Duan, 2017; Klein, Molloy, & Blins- field, 2012; Van den Hooff & Van Weenen, 2004). Moreover, past research shows that commitment is an important ingredient of the continuance intention of members of VCs (Charband & Navimipour, 2016; Gharib et al., 2017; Laux et al., 2016).

Commitment has largely been studied in management literature (Klein et al., 2012, Meyer, Stanley, Herscovitch, & Topolnytsky, 2002; Mowday, Steers, & Porter, 1979; Van Rossenberg et al., 2018) and in VCs (Chiu et al., 2006; Dholakia et al., 2004; Gupta & Kim, 2007). Although there have been numerous definitions, Klein, Molloy, and Blinsfield (2012) have refined the concept, comparing it to related constructs such as identification or intention to participate. Based on their work, we define commitment as a perception of alignment with the goals and values of the community, creating a volitional bond that reflects dedication to the community and responsibility for it (Klein et al., 2012; Van den Hooff & Van Weenen, 2004).

In VCs, SoVC and commitment are related concepts (Chang et al., 2016; Guo & Cheng, 2016; Laux et al., 2016). Personal relations produce social exchanges among participants (Klein et al., 2012), facilitating membership salience and collective identity—SoVC—(Lee et al., 2015), which, in turn, contribute to the development of commitment (Klein et al., 2012). In addition, commitment implies a conscious choice to make an effort, work, and help other participants. In this regard, feelings of identity—SoVC—lead to a positive disposition to dedicate time and effort to the VC— commitment—and both affect the intention to continue.

Recent studies propose the mediating effect of commitment between SoVC and participation in different forms. Chang et al. (2016) propose a model that illustrates the mediating effect of commitment in the relationship between SoVC and knowledge sharing in VCoPs. Specifically, SoVC facilitates interpersonal relationships that increase the trust and commitment of the users. In addition, their results show that when VC users consider themselves to be part of the community, they feel obligated to contribute to the group and build up a similar approach to that of their teammates. Similarly, Laux, Luse, and Mennecke (2016) studied dropouts in academic environments and tested a model that examined how SoVC influenced persistence, measured through dropout intention as well as an indirect effect through affective organizational commitment in learning VCs. Specifically, the results confirm that the higher the perception of SoVC, the more the users contribute to the VC.

Thus, we propose that, consistent with past literature, members who feel part of a VC (SoVC) after some interaction will feel that they have an obligation to the community as a collective. They will experience greater commitment toward the group, which, in turn, will make them more likely to continue to participate. Moreover, we expect to find a partial mediation of commitment because other important relational capital dimensions related to SoVC (trust, norm, reciprocity; Chang et al., 2016) could also play a role in transmitting the effects of SoVC on VCs' sustainability. Based on this reasoning and previous research (Abfalter et al., 2012;

Blanchard, Askay, & Frear, 2010; Chang et al., 2016; Chen et al., 2013; Laux et al., 2016), we hypothesize the following:

Hypothesis 1: Commitment will partially mediate the relationship between SoVC and intention to continue.

The Moderating Role of the Type of VC

Previous research on SoVC and intention to continue (Blanchard, 2008; Chen et al., 2013) has suggested that there is a mediating effect of commitment (Chang et al., 2016; Laux et al., 2016). However, these studies pay little attention to the differences in this relationship depending on the type of VC, even though different VCs have specific characteristics and internal dynamics that affect the members' SoVC and commitment.

Henri and Pudelko (2003) classified VCs according to two different dimensions that vary on a continuum: the strength of the social bond and the intentionality of the gathering. On the one hand, the strength of the social bond among the members in a VC affects the way interactions take place in the community (e.g., interactions in small subgroups or collective action; reactive vs. proactive participation). On the other hand, the intentionality of the gathering will vary from community to community, depending on the appearance of common objectives and interdependence among the participants (Bock, Ahuja, Suh, & Yap, 2015; Gangi & Wasko, 2009; Meirinhos & Osorio, 2009). Both dimensions sequentially increase from less to greater complexity. Thus, whereas some communities have a stronger social bond—for example, feelings of cohesion and emotional attachment— and intentionality of gathering and interdependence (e.g., communities of practice), other communities are weaker in these dimensions (e.g., communities of interest), with learning communities lying at a midpoint between the other two. Based on the above, we review specific characteristics of the three VC types considered in this study: communities of interest, virtual learning communities, and VCoP.

Specifically, community of interest participation intention is based on the members' individual contributions to their personal networks (De Valck, Langerak, Verhoef, & Verlegh, 2007, Dholakia et al., 2004; Kirkman, Mathieu, Cordery, Rosen, & Kukenberge, 2011). Access is open and free; participants create public or semipublic profiles, articulate a list of connections (e.g., followers with whom you share a topic of interest on Instagram and Quora, connections from groups on social networking sites), and interact with other individuals. They exchange information about the shared topic (De Valck et al., 2007; Gerard, 2012; Kaplan & Heinlein, 2010). However, participants' interactions are not embedded in a group with a shared mission, and they do not represent a collective effort—low intentionality and a weak social bond (Henri & Pudelko, 2003). Therefore, there is a low level of interdependence, intentionality, and potential anonymity, which makes the ties among participants weaker than in other types, thus hindering the SoVC (Liu, Ainsworth, & Baumeister, 2016). In these communities, the interactions are usually one-to-one (people with whom participants may have a previous off-line relationship; Brandtzæg & Heim, 2009, Liu et al., 2016), and few participants have influence over the whole community (e.g., influencers who perceive themselves as dynamic opinion leaders), with several passive users—lurkers—with peripheral participation (Fang & Zhang, 2019; Fischer, 2001). In short, there is a lack of common ground for breeding a strong SoVC because the emotional attachment is to specific individuals, and there is no strong identification or bond with the whole network (Dholakia et al., 2004; Liu et al., 2016).

Virtual learning communities are organized mainly by students (geographically dispersed or not) who belong to the same class or institution. Participation intention is driven by the acquisition of knowledge about the academic topic through common interaction—interdependence—which benefits the SoVC (Blanchard & Markus, 2002). However, it is a task-based community, oriented toward specific learning activities (Gannon-Leary & Fontainha, 2007; Meirinhos & Osorio, 2009). These tasks are based on the formal curriculum, and participants are directly or indirectly required to join temporarily, so that the ties are

“artificially” created in some cases, hampering the formation of a strong social bond. In addition, the intention to continue to participate is limited because the participant has to be a member of the academic institution (Gannon-Leary & Fontainha, 2007; Henri & Pudelko, 2003), which limits the SoVC and makes commitment (the willingness to make an effort) an important variable in participation.

The main goal of the VCoP is the enrichment of the professional practice among its members (Henri & Pudelko, 2003). It is a practice-based community with participants who interact voluntarily —high intentionality— share expertise, exchange advice and ideas, help others, and develop specific competences while collaborating (Gannon-leary & Fontainha, 2007; Henri & Pudelko, 2003; Wasko & Faraj, 2005). In this community, the participation is intrinsically important to the members (Meirinhos & Osorio, 2009). It builds shared narratives and personal relationships with strong ties (Dholakia et al., 2004), which in turn facilitates the development of a collective identity—strong social bond (Henri & Pudelko, 2003)—. Moreover, these communities are not time-bounded, and so they develop more organically (Gannon-Leary & Fontainha, 2007).

As described above, SoVC is a major element of participation in VCs (Blanchard, 2008; Chen et al., 2013), but it may depend on the type of VC. Specifically in communities of interest, it is less developed than in the other types of VCs, and participants will only continue to participate whether they make an effort to get involved (Henri & Pudelko, 2003). Therefore, we consider that commitment has a greater mediating role in fostering the intention to continue in communities of interest than in the other types of VCs, where the direct effect of SoVC is higher. Specifically, SoVC plays a key role in the intention to continue in VCoP. The long life span and shared experiences among members (Tonteri et al., 2011), as well as the relevance of the interactions and the strong ties, influence the development of a strong SoVC in VCoP (Chang et al., 2016). Finally, the learning community lies at the midpoint between communities of interest and VCoP in terms of shared emotional bonds and intentionality.

Therefore, we consider that the mediating effect of commitment will be lower in virtual learning communities than in communities of interest but higher than in VCoP.

In conclusion, consistent with the above-mentioned characteristics and past research, we hypothesize that:

Hypothesis 2: The effect of the SoVC on the intention to continue mediated by commitment varies depending on the type of VC.

Hypothesis 2.1: The indirect effect of SoVC on intention to continue through commitment is higher in communities of interest than in VCoP.

Hypothesis 2.2: The indirect effect of SoVC on intention to continue through commitment is higher in virtual learning communities than in VCoP.

Hypothesis 2.3: The indirect effect of SoVC on intention to continue through commitment is higher in communities of interest than in virtual learning communities.

Method

Participants

The sample consisted of 299 individuals from three different VCs, 147 males and 152 females. Regarding their age, 61.5% of the participants were less than 30 years old. Regarding the type of VC, (1) 29.1% of the total sample were practitioners from a VCoP of workers in a confederation of organizations for people with intellectual disability, (2) 18.1% of the total sample were undergraduate students enrolled in the bachelor's degree in business administration from the National Distance Education University who also participated in a virtual learning community, and (3) 52.8% of the sample were undergraduate students from the University of Valencia and Polytechnic University of Valencia who participated in different communities of interest.

Procedure

The present research follows a correlational design (Creswell, 2012). The sample was obtained through a convenience sampling method based on their participation in VCs. To do so, we searched for communities that fit the types of VCs in Henri and Pudelko's (2003) typology. Hence, we contacted an organization that used a VCoP and checked the characteristics of the VC. Participants exchanged ideas, opinions, and information about their jobs; gave mutual support; and collaborated voluntarily in the community. For the virtual learning community, we wrote community administrators and verified the characteristics of the VC. The community was specifically created and managed by the students to solve doubts, exchange ideas, and comment on the activities held during the course. Finally, we asked for the participation of undergraduate students enrolled in an organizational development and human resources management courses in the last year of the university degree at two public Valencian universities, and we recruited individuals who participated in at least one community of interest. They participated in different communities of interest on various topics such as professional networking and content exchange for their fields of knowledge, photography, traveling, or drawing, among others. Participation was voluntary, and they did not receive any material compensation for it. After excluding incomplete answers, 299 responses were used for data analysis.

Measures

SoVC was measured by 8 items taken from the Peterson, Speer, and McMillan (2008) "Brief Sense of Community Scale." This scale has been used in previous research on VCs (Mamonov, Koufaris, & Benbunan-Fich, 2016; Rosen, Lafontaine, & Hendrickson, 2011). This measure evaluates the extent to which the user feels that he or she is a member, identifies with the community, and has perceptions of belonging and attachment. Original items have been slightly modified for this study (e.g., "I can get what I need in this neighborhood" was changed to "in this VC I can get what I need"). A sample item is "In this

VC, I feel like I am member of the community." The items were measured on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Cronbach's α was .89.

Commitment was measured by 5 items taken from Van den Hooff and VanWeenen (2004). This instrument evaluates the relative extent to which the user perceives himself or herself to be involved in the VC, reflecting responsibility for the community and dedication toward it (Klein et al., 2012). A sample item is "I put in extra effort in order to make this community succeed." We deleted 1 item for reliability and parsimony considerations (Wieland, Durach, Kembro, & Treiblmaier, 2017) due to low reliability of the scale—below .7 classic cut-off criterion. A 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) was used to measure the scale. Cronbach's α was .73.

Intention to continue was measured by 6 items taken from Zhao, Stylianou, and Zheng (2013). This scale evaluates the user's estimation of his/her probability of continuing to participate in the VC. A sample item is "I intend to continue to post messages in response to other messages." Respondents had to indicate their level of agreement on a 5-point Likert-type scale ranging from 1 (*very dissatisfied*) to 5 (*very satisfied*). Cronbach's α was .89.

Data Analysis

We checked for the correlations and factorial structure of the measures through confirmatory factor analyses by means of Mplus 6.31 (Muthén & Muthén, 1998–2011) and by testing the main fit indexes provided (χ^2, root mean square error of approximation [RMSEA], comparative fit index [CFI], Tucker–Lewis Index [TLI], and standardized root mean squared residual [SRMR]).

To test the hypotheses, we used the Process 3 plug-in (Hayes, 2017), and the models were estimated for 5,000 bootstrapped samples, creating a 95% bias-corrected confidence interval (CI). Mediation and moderated mediation analyses were conducted (Zhao, Lynch, & Chen, 2010; Hayes, 2015, 2016, 2017; Hayes & Montoya, 2017).

First, we tested Hypothesis 1 through a simple mediation analysis. We entered SoVC as the independent variable, commitment as mediator, and intention to continue as the dependent variable. We tested Hypothesis 2 by means of moderated mediation analyses (Hayes & Montoya, 2017; Muller, Judd, & Yzerbyt, 2005). The previous variables (SoVC, commitment, and intention to continue) were introduced as specified in Hypothesis 2.1, and type of VC was introduced as a moderator variable. Because type of VC is categorical, the Process 3 plug-in automatically creates dummy variables (Aiken & West, 1991). We used indicator coding (Hayes & Montoya, 2017). We generated two dummy variables, DRS (comparing VCoP and communities of interest) and DLC (comparing VCoP and virtual learning communities). Next, we specified Process Model 7. Then, following Hayes and Montoya (2017), we recoded our categorical variable to generate a third dummy variable DEX (comparing communities of interest and virtual learning communities). We checked the results of the moderated mediation index. This test, as explained by Hayes (2015), quantifies the association between an indirect effect and a moderator, testing whether the index is different from zero by means of the CIs. If the CI does not include zero, we can conclude that there is moderated mediation, and vice versa.

Results

Preliminary Analysis

Table 1 summarizes the descriptive statistics and Pearson's correlations.

Table 1. Means, Standard deviations, and Correlations.

Variables	Mean	*SD*	1	2	3
1. Sense of virtual community	4	.87	(.89)		
2. Commitment	3.42	.88	.656**	(.73)	
3. Intention to continue	4.32	.87	.635**	.568**	(.89)

Note. Interitem reliability values are in parentheses along the diagonal. **p< .01 (two-tailed).

Following Byrne's (2012) procedure, we ran two confirmatory factor analyses to evaluate the discriminant validity and verify that the set of items in each construct was measuring a distinguishable factor (although correlated with the others). To do so, we compared the fit of a three-factor model (items load in three different factors: SoVC, commitment, and intention to continue) to the fit of an alternative one-factor model (all the items load in a single factor). Considering that the items were nonnormally distributed (Field, 2009; Gravetter & Wallnau, 2014) and that there was a large difference in the χ^2 values, we used maximum likelihood estimation with robust standard errors estimation. Table 2 presents the fit indexes RMSEA, CFI, TLI, SRMR, χ^2/df, and the *p* values of both models. The three factor model showed a good fit to the data and met or was very close to the cutoff criteria for most of the common fit indexes (RMSEA < .08; CFI > .95). Overall, the three-factor model showed a statistically significant better fit than the one-factor model ($\Delta\chi^2$=204.03, *df*=1, p<.001).

Table 2. Confirmatory Factor Analyses

Model	χ^2/df	*p*	Root Mean Square Error of Approximation	Comparative Fit Index	Tucker–Lewis Index	Standardized Root Mean Squared Residual
Three factors	2.06	<.001	.061	.94	.93	.058
One factor	3.85	<.001	.100	.83	.81	.068

Hypothesis Testing

Mediation model. We found a significant indirect effect of SoVC on intention to continue through commitment (estimate of ab product term = .1753; Boot *SE* = .039; 95% CI [.1036, .2575]). Because the CI does not include zero, the indirect effect is statistically significant, and there is mediation (Zhao et al., 2010, Hayes, 2013). This result supports Hypothesis 1. Moreover, the direct effect was also positive and significant: the c' shows that SoVC as a predictor of intention to continue had a value of b= .4669, t (293)= 8,0198, 95% CI [.3523, .5815]. In sum, we have complementary mediation, also known as a consistent model, in

which both the direct effect and the indirect effect exist and point in the same direction (partial mediation; MacKinnon, Fairchild, & Fritz, 2007; Zhao et al., 2010).

Moderated mediation model. Supporting Hypothesis 2, we found that the mediation depended on the type of VC. The results of the moderated mediation indexes (Table 3) show that there was a moderated mediation effect on the dummy variables comparing VCoP and communities of interest (DRS) and VCoP and virtual learning communities (DLC). The values of the moderated mediation indexes for DRS and DLC were .09 and .12, respectively, with CIs that do not include zero. By contrast, there was no moderating effect of the dummy variable comparing virtual learning communities and communities of interest (DEX). The value of the moderated mediation index for DEX was .03, and the CI included zero.

Table 3. Moderated mediation indexes.

Moderator	Index	Boot (LLCI, ULCI)
DRS	.09	[.04, .17]
DLC	.12	[.02, .23]
DEX	.03	[−.06, .11]

Bootstrap analyses showed that the indirect effect of SoVC on intention to continue through commitment was higher for communities of interest and virtual learning communities (B_{COI}=.20, 95% CI [.06, .11]; B_{VLC}=.23, 95% CI [.11, .36]) than for virtual communities of practice (B_{VCoP}=.11, 95% CI [.06, .17]). These results provide support for Hypotheses 2.1 and 2.2. However, the indirect effect of SoVC on intention to continue mediated by commitment was similar for virtual learning communities and communities of interest. Thus, our results do not support Hypothesis 2.3.

Based on Aiken and West (1991) and Hayes and Montoya (2017), figures 2 and 3 graphically represent the significant interaction effects found in our research. When comparing VCoP and communities of interest in figure 2, we observe that participants in communities of interest tend to perceive more commitment as SoVC increases, in

comparison with VCoP members. Both simple slopes tests are statistically significant (communities of interest t=10.85, p<.001; VCoP, t=5.40, p<.001). In figure 3, when SoVC increases, so does commitment, but it increases to a greater extent in virtual learning communities than in VCoP. Members of virtual learning communities with high SoVC show higher commitment than members of VCoP. The simple slopes test is also significant for the former (virtual learning communities, t=5.57, p<.001).

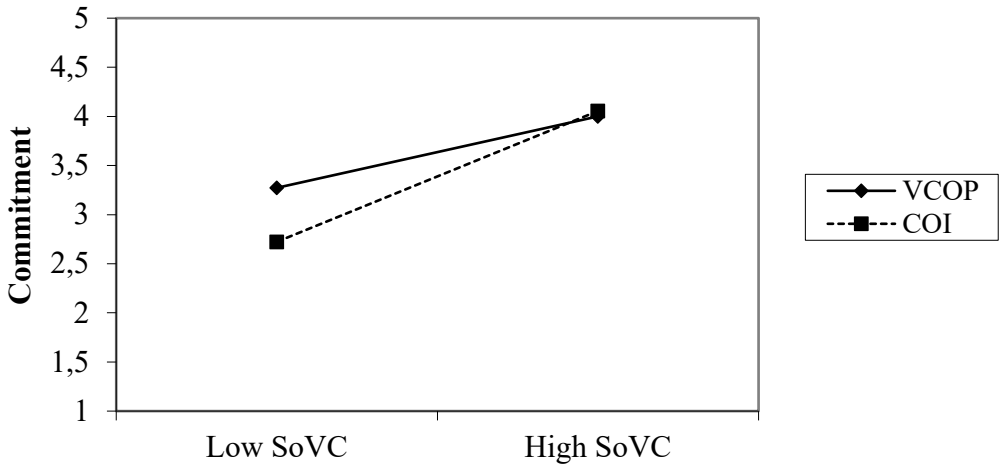

Figure 2. Simple Slopes: Type of virtual community (virtual community of practice-VCoP and community of interest-COI) moderating the relationship between sense of virtual community and Commitment.

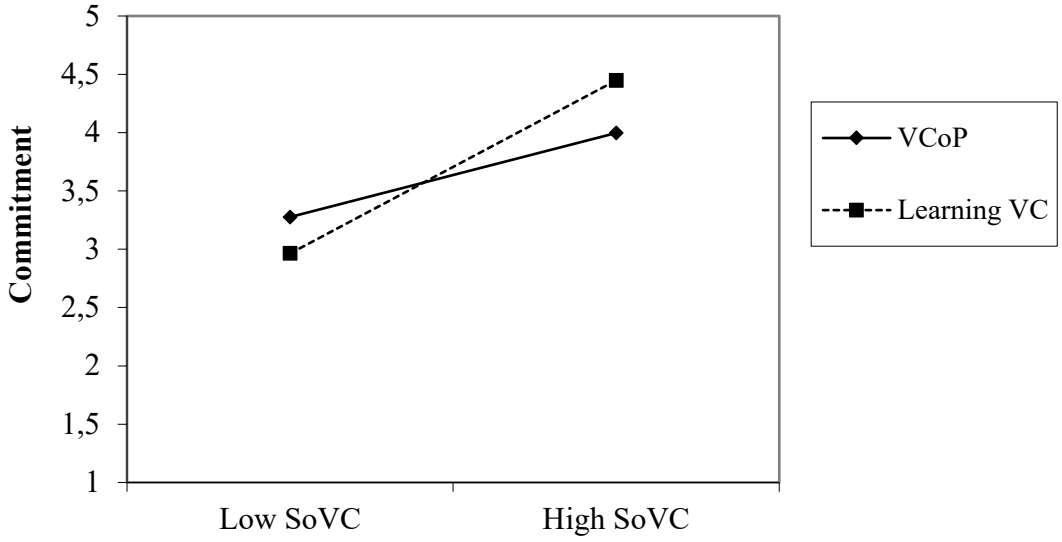

Figure 3. Simple Slopes: Type of virtual community (virtual community of practice-VCoP and virtual learning community) moderating the relationship between sense of virtual community and Commitment.

Discussion

The purpose of this research was to enhance the understanding of the reasons members of VCs continue to participate in their communities. To do so, we tested a moderated mediation model in which the indirect effect of SoVC on intention to continue through perceived commitment was moderated by the type of VC.

Findings

Consistent with previous literature (e.g., Abfalter et al., 2012; Meyer et al., 2002; Laux et al., 2016), the results of this study show that the relationship between SoVC and intention to continue is mediated by commitment (Hypothesis 1). According to the SIDE model, an important theoretical framework in this context (Reicher et al., 1995; Spears et al., 1990), individuals interacting in VCs create online common identities and try to establish social ties that enhance the exchange of support and participation among the members (Dholakia, Bagozzi, & Pearo, 2004; Chiu et al., 2006; Zhang, Jiang, & Caroll, 2010). In turn, this

participation may promote the establishment and development of VCs because they are based on the altruistic contributions made by their members (Raven, 2003; Kirkman et al., 2011), reinforcing relational aspects and positive attitudes among members of the community. In fact, our findings provide empirical evidence for commitment as a mediating mechanism in the relationship between SoVC and the intention to continue. Overall, not only what the members feel about the community but also their willingness to make a considerable effort on behalf of the community will lead to its sustainability. Therefore, a successful VC will aim to fulfill its members' need for a common identity and belonging, in addition to making them engage with the community.

This study also concurs with previous research suggesting that different types of VCs operate on different principles (Abouzahra & Tan, 2014; Blanchard et al., 2010; Chang et al., 2016). As explained above, intensified group identification differentially affects sustained participation depending on the characteristics of the VC (Kim & Park, 2011). Therefore, our results show that the relationship between SoVC and commitment is contingent upon the type of VC; in other words, the type of VC moderates the mediation model (Hypothesis 2). As our findings show, the indirect effect of SoVC on intention to continue through commitment was higher for communities of interest and virtual learning communities than for VCoP. Consistent with previous theory and research (Henri & Pudelko, 2003, Meirinhos & Osorio, 2009; Chen et al., 2013, Chang et al., 2016), participation in VCoP is mediated by commitment, but when compared to other types (communities of interest and virtual learning communities), it has the smallest indirect effect.

Members of VCoP participate voluntarily and are intrinsically motivated to do so (Gannon-leary & Fontainha, 2007). In addition, the possibility of long-term participation helps SoVC in these communities to become more relevant to their sustainability than in other types of communities. For people who join a VCoP, creating SoVC could be a means to continue to participate (Ostrom, 2000). On the other hand, in communities with fewer shared emotional connections and social ties and less intentionality—communities of interest and virtual

learning communities—continued participation will emerge more from the members' specific commitment to the community.

Contrary to previous studies (Henri & Pudelko, 2003; Laux et al., 2016; Zhang, 2010), our results do not show significant differences in the mediation in communities of interest compared to virtual learning communities, with the mediation being equally important in both. The attributes of the members of these two types of VCs may not be as different as expected. In virtual learning communities, participants with a high intention to continue have individual reasons that make them committed to their community (e.g., they personally enjoy the topic or want to get high academic grades). As explained above, participation in virtual learning communities is sometimes a compulsory activity and relevant to a given cohort of students only while enrolled in the institution. Thus, in virtual learning communities, as in a normal—physical—classroom, committed individuals mainly tend to participate. Consequently, we could not find a significant difference between the former and communities of interest, in which individualistic goals and lack of common rules and objectives make commitment a key variable in participation and the strongest mediator. Communities of interest have "the least community" of the different types studied in this research. Thus, community of interest participants are not necessarily active participants (they become lurkers), and they do not expect others to participate—there is no sense of reciprocity—(Henri & Pudelko, 2003). In addition, the process of negotiating meaning makes a large number of people engage in only peripheral participation, even though they feel part of the community (Fischer, 2001, quoted by Henri & Pudelko, 2003, p. 478), whereas a small group of participants become a committed hard core in the community because of the content they share (Iyengar, Van Den Bulte, Eichert, West, & Valente, 2011; Lü, Zhang, Yeung, & Zhou, 2011). This situation leads to a weak-tie community in which commitment clearly mediates the direct effect between SoVC and intention to continue.

Limitations and Future Research

This study has certain limitations that should be noted, despite the cautious steps taken during the theoretical deduction, data collection, and analyses. First, regarding the design, our research does not allow us to infer causality due to its cross-sectional design. To address this limitation, longitudinal studies are needed to explore the order of the proposed relationships. Second, in future studies that expand our results, one topic to address would be the conceptualization of sustainability as intention to continue. Although continuance intention in information systems is a valid predictor of continuance behavior (Bhattacherjee & Lin, 2015), there are different approaches that future literature could consider when talking about sustainability (Bock et al., 2015). Third, even though examining the context where the VCs were used was not the aim of this study, context could play an important role in the relationships between the studied constructs. Thus, in future studies, the domain of the organizations promoting the VCs should be considered (VCs from public vs. private organizations), as well as the type of activity the organization performs (e.g., VCs used in the service industry, in the manufacturing industry), as other potential moderators. Fourth, commitment was a partial mediator in our model, demonstrating that it is necessary for the sustainability of the VC, but there could be other relational aspects to consider in future research (trust, norm, reciprocity, or mutual support) that could be mediating the relationship between SoVC and intention to continue. Finally, even though we followed the paradigm suggesting that SoVC increases participation, some authors assume an inverse or circular relationship between these two variables (Guo & Cheng, 2016; Talò et al., 2014; Tonteri et al., 2011), and they use SoVC as a result in itself. Consequently, further research could consider the relationship between these two variables, specifically attending to the antecedents of SoVC in specific types of VCs.

Theoretical and Practical Implications

The present study extends the stream of research dedicated to investigating sustainability in VCs (Bock et al., 2015). First, our findings are useful for researchers because we expand previous research about the antecedents of VC continuance intention. VCs' sustainability will depend on the bond perceived by committed participants (instrumental vs. acquiescence; Klein et al., 2012).

Second, we shed light on the moderating effect of the type of VC in the mediation. The relationship between SoVC and intention to continue is not only mediated by commitment, but it also varies across different types of communities. Although previous literature has empirically considered type of VC as a moderator, along with other constructs (Abouzahra & Tan, 2014; Koh & Kim, 2003), and directly suggested the need to continue to study it (Zhang, 2010, Laux et al., 2016), to date, no study had tested a comprehensive model that included the type of VC as a moderator of the mediation. We have studied three of the most relevant types of VCs today—VCoP, virtual learning communities, and communities of interest—overcoming one of the main limitations of previous research in the field of VCs, that is, only addressing one specific community (e.g., Chang et al., 2016; Frison & Eggermont, 2016; Laux et al., 2016). Our findings suggest an important implication: How and when SoVC is effective for achieving sustainability in VCs? We found that commitment and type of community are key factors that contribute to explaining different mechanisms through which SoVC affects sustainability in VCs. Specifically, in VCoP, SoVC is a key variable, and commitment is less relevant than in other types of VCs—such as, in our case, communities of interest and virtual learning communities—.

Thus, to be sustainable, organizations must create VC environments that will favor users' retention. Our results have practical implications for community managers, companies, and organizations whose business model is based on a VC. To create or develop a VC that withstands the test of time, it is necessary to retain the members and foster their participation

(e.g., posting questions, asking and answering doubts, exchanging relevant information). To do so, community managers and organizers need to work on individuals' emotional perceptions and facilitate participants' positive feelings toward the community through their interactions—replying to comments, attending to personal information disclosures that allow them to build online identities, answering questions thoughtfully, considering the feedback received by participants, creating spaces for virtual gathering, and so on. Moreover, even if participants have feelings of immersion, emotional attachment, membership, and belonging—high SoVC—community managers should work on engaging key members, that is, participants who post popular content and contribute significantly to the VC. These members are committed individuals who participate, and they could become VC facilitators and motivate other members to get involved.

Furthermore, it is important to address the goals and motives of the specific community one wants to build, its characteristics, and its target participants because, as our study shows, each VC works in a particular way that influences its sustainability. For example, in light of our results, virtual learning communities could become virtual facilities that substitute physical spaces (Hiltz & Wellman, 1997). By contrast, VCoP will require more careful work by the organizer in preparing activities (e.g., allow public profiles, manage individual cues that foster individual or collective identities, allow reward systems and participation rankings) that facilitate the emergence of a strong feeling of belonging, attachment, and SoVC.

Conclusion

Currently, the use of VCs is increasing, and this tendency will continue in the future in several contexts such as politics (Gable, 2015; Zhang, Johnson et al., 2010), education (Latif, Uckun, & Demir, 2015; Slavich & Zimbardo, 2012), or work and commercial practice (Aghakhani, Karimi, & Salehan, 2018; Li & Lee, 2013), among others. The globalization of advanced societies is leading to a highly virtualized, hyperconnected world. Our study provides an

interesting framework for understanding the effect of SoVC and commitment on sustainability in different types of VCs, providing a valuable perspective for in-depth understanding of members' behaviors in such communities. We carried out a comprehensive approach based on previous theory and research, and we proposed an effective model for sustainability in VCs. Our findings indicate that sustaining and developing a VC requires fostering a sense of community and commitment that engages participants, but the relative importance of the elements will vary depending on the type of VC.

Authors' Note

To access an anonymized version of the data presented in this article, please contact the corresponding author at virginia.orengo@uv.es. The computer softwares used to obtain the reported results were SPSS 22.0 (SPSS, IBM, New York, NY, USA), Process 3 plug-in (Hayes, 2017), and Mplus 6.31 (Muthén &Muthén, 1998–2011).

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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ESTUDIO 2: Is Team Emotional Composition Essential for Virtual Team Members' Well-Being? The Role of a Team Emotional Management Intervention

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Is team emotional composition essential for virtual team members' well-being? The role of a team emotional management intervention

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Abstract: The aim of this study was twofold. First, we examined the relationship between virtual teams' emotional intelligence composition and three indicators of their members' well-being, members' satisfaction with the team and positive and negative affective states. Second, we analyzed the moderator role of an online team emotional management intervention in the effects of the team emotional intelligence composition. One hundred and two virtual teams participated in an experimental study with repeated measures. Teams were randomly assigned to either an intervention designed to help them detect and manage emotions during virtual teamwork or a control condition (with no intervention). We followed a hierarchical data strategy and examined a number of nested models using Hierarchical Linear Modeling. Our findings showed that virtual teams' emotional intelligence composition is a key driver of the team members' well-being, and that a team emotional management intervention moderated the impact of the team composition of emotional intelligence, buffering its influence.

Keywords: team composition; emotional intelligence; team emotional management; training; members' well-being; virtual teams

1. Introduction

Virtual teams in which employees operate remotely from each other are a reality, and given the numerous technological advancements, they will become even more common in the future [1]. A recent study on virtual teams in 90 countries showed that 89% of the

participants worked in virtual teams, and more than half of these teams were composed of members who were geographically dispersed [2]. In virtual teams, members mainly communicate and perform their work using computer-mediated communication [3,4]. Tools such as instant messaging, emails, video calling, or group support systems enable virtual team members to co-ordinate their actions and reach common goals with speed and efficiency [3].

The use of virtual teams enables organizations to do things collectively that face-to-face teams cannot. Nevertheless, due to their characteristics of dispersion and technological mediation, virtual teams have a number of disadvantages or "challenges" that face-to-face teams do not have. Some of these disadvantages are related to the socioemotional management of work teams (e.g., communication and collaboration difficulties, potentially lower team engagement in team members, difficulties in creating trust and shared responsibility, isolation and high levels of social distance) [5]. Virtual team literature indicates that these teams, compared to face-to face teams, "are more oriented toward certain aspects of the task than toward the socio-emotional aspects produced among their members" [6] (p. 83). The lack of attention paid to socioemotional aspects fosters a tendency to behave in a more impersonal, hostile, and uninhibited manner in virtual teams, thus leading to low empathy and personal connection, a lack of clarity and misunderstandings, distrust, and suspicion [7]. The reduction in emotional verbal information in computer-mediated communication is also a disadvantage. Gilson, et al., [8] pointed out that these consequences of working virtually using computer-mediated communication have an impact on members' well-being. Due to the need to develop positive socioemotional links among team members, a main area of interest for researchers and practitioners is to gain knowledge about how to foster a positive work climate in virtual environments [9]. Researchers have highlighted that developing a positive emotional environment in teams is essential in order to achieve "healthy" teams [10]. Therefore, examining the way emotions are constructed, modified, fostered, or suppressed within virtual teams is an important step in achieving high levels of

well-being among the members of virtual teams [8,11]. The majority of the research on well-being has studied it from a hedonic perspective. Thus, well-being is conceptualized as a state of pleasure and an experience of positive affect [12]. Most of the findings indicate that there is a positive relationship between well-being and job performance (see, for instance, [13-16]). Additionally, team members' well-being and other outcomes, such as team viability, also help to maintain the group's performance over time [17]. In a recent review on virtual teams, Gilson et al., [8] stated that an important gap in the virtual team literature involved absence of an analysis of how to promote high levels of well-being within these kinds of teams.

Kelly and Barsade [18] stated that affective experiences within teams result from individual-level affective factors that team members possess and that define the team's emotional composition [19,20]. Currently, the role of team composition in terms of emotional skills or traits has been described as an emergent area of team research [10,21], and its impact on members' well-being has begun to be empirically supported in face-to-face teams (e.g. [22]). Specifically, research has shown that emotional intelligence (i.e., individual emotional skill in detecting, understanding, and managing one's emotions and those of others; [23]) is a significant predictor of team members' well-being in face-to-face teams [24]. In computer-mediated work environments, high emotional intelligence among members of virtual teams would also be particularly important because verbal and nonverbal emotional cues are reduced in computer-mediated communication. Thus, virtual teams composed of members with low emotional intelligence may find it more difficult to perceive and manage the members' emotional experiences within the team [25], negatively influencing members' well-being. However, to our knowledge, this association has not been examined in virtual contexts. In this regard, we propose that a team emotional management intervention would compensate for this deficit and benefit the team members' well-being. When we train virtual teams in team emotional management, we are giving their members abilities and tools that will help them to manage the expression of emotions and interactions with their colleagues.

The aim of this study was twofold. First, we analyzed the influence of the team composition of individual emotional intelligence on three indicators of members' well-being, that is, satisfaction with the team and positive and negative affective states related to virtual work. Second, we examined the moderator role of a team emotional management intervention in the effects of team emotional intelligence composition on virtual teams. We will examine these objectives using a multilevel longitudinal approach.

1.1. Team Composition of Emotional Intelligence and Members' Well-being

In the past decade, virtual team research has focused on team composition as critical input for virtual teams' effectiveness [8]. Most team composition studies have examined members' gender, race, age, and personality as compositional characteristics [26]. However, the effects of members' emotional characteristics have mostly been ignored. Virtual teams' emotional composition is a "bottom-up" component that begins with the variety of individual-level affective components members bring with them to the group interaction.

This virtual team emotional composition would shape the affective experiences of team members [18]. Some researchers have examined trait affect as a compositional variable. Trait affect consists of a predisposition to perceive the world and one's future positively or negatively [27]. Trait affect permeates our experiences, affecting our state affect and our present and future individual actions [18]. Abundant empirical evidence has shown the effects of trait affect on individual-level behaviour. For example, Bagrationi and Thurner [28] showed that employees with a negative view of the future easily feel threatened and tense due to organizational change and show more resistance. In contrast, employees with a positive view of the future are more likely to accept the change and feel greater security, happiness, and enthusiasm about the future situation. Moreover, a positive view of the future has been found to have an influence on team level processes and outcomes [29,30] and team affective states in face-to-face teams. For instance, George [31] found that teams' mean trait positive and negative affect were related to members' positive and negative affective states in sales

teams. A less studied emotional factor in team emotional composition is individual emotional intelligence [22]. Having emotional intelligence involves being actively able to identify, understand, process, and influence one's own emotions and those of others in order to guide our feeling, thinking, and action [24]. Emotional intelligence is a personal resource related to positive results because it promotes positive attitudes toward the team task and fosters communication processes and the development of social links among individuals [24]. As with other individual characteristics such as personality and cognitive ability, these individual emotional abilities are aggregated to create a phenomenon at the group level [32], that is, team composition of individual emotional intelligence (EI). Team EI composition refers to the overall level or intensity of EI within the team, and it is typically measured using the mean of members' scores [33]. Thus, some teams would be composed of members with high levels of EI (high average individual emotional intelligence), and others would be composed of members with low levels of EI (low average individual emotional intelligence).

This team-level emotional characteristic may produce top-down influences on the affective states of virtual team members through its effect on patterns of interaction and social influence among members [33]. Forsythe [34] suggested the importance of having not only individual task-related knowledge, skills, and abilities when assembling teams, but also social and emotional skills that influence conscious affective sharing of emotions, which then promotes team-level functioning. In agreement with this author, different team composition models indicate that overall team functioning is improved by selecting individuals with high levels of specific skills. For instance, traditional personnel-position fit models, such as Muchinsky and Monahan's person-environment model of supplementary fit [35], argue that all virtual team members should have high levels of socio-emotional skills in order to facilitate interpersonal interactions. Personnel models with teamwork considerations assume that when members, on average, possess greater team-related competencies, the team is more likely to function effectively [36]. Finally, team profile models suggest that some distributions

or more complex profiles of members' attributes, including task- and socioemotional-related attributes, contribute to the ability to orchestrate teamwork functions [37].

Empirical evidence has shown that, in face-to-face teams, EI is positively related to the quality and effectiveness of interpersonal interactions [38]. For instance, Jordan and Troth [39] and Offerman et al., [40] found that teams with higher levels of EI functioned better than teams with lower levels of EI. Scholars have also found that teams with members with high EI reported higher levels of intra-team trust and psychological safety among team members and lower levels of conflict, greater team learning, and more collaborative decision-making [41-43]. Depending on a team's EI composition, group functioning will be modified, and affective outcomes may differ.

Transferring these findings to virtual teams, virtual teams composed of members with higher emotional abilities will be more effective at detecting and managing emotions [44], which could be reduced in computer-mediated communication environments [45]. Different approaches argue that, in a computer-mediated communication context, it is difficult to detect and, therefore, manage members' emotions. For instance, cues-filtered-out approaches [25,46] attribute the lack of emotions in virtual teams to the absence of non-verbal and non-textual cues in virtual environments. For some researchers, the restrictions on transmitting cues and deindividuation processes cause socio-emotional information to be reduced, if not completely lost (e.g. [47]). However, Social Information Processing Theory [48] argues that, in computer-mediated communication, it is possible to convey affective and emotional information and relational communication, despite the reduced availability of nonverbal cues. This theory states that members are able to exchange socio-emotional information as if they were in face-to-face settings, but this requires exchanging several messages and adapting the content and style of written messages online [49]. Thus, virtual teams need more time to process socio-emotional information and develop effective socio-emotional relationships among team members, compared to face-to-face teams. Therefore, virtual teams whose members have better emotional awareness and emotional management abilities will be more

effective in developing accurate collective emotional knowledge, attitudes, and behaviours over time that facilitate the management of the interpersonal relationships [50]. Hence, in virtual teams with a high average level of EI, interpersonal interactions and group functioning are better than in teams with low levels of EI. These team EI levels, in turn, influence team members' emotional states and satisfaction with the team.

Despite prior research on the consequences of team composition in virtual teams [8], to our knowledge, no study has analyzed the influence of team EI composition on virtual team processes or outcomes. Considering these theoretical arguments, we formulate the following hypotheses:

Hypothesis 1. *Team EI composition will be positively associated with members' satisfaction with the team (Hypothesis 1a) positive affective states (Hypothesis 1b) and negatively associated with members' negative affective states (Hypothesis 1c) over time*.

1.2. The Moderator Role of a Virtual Team Emotional Management Intervention

Based on the above, we can conclude that it is important to design teams whose members have high EI in order to foster members' well-being within virtual teams [51, 52]. Nevertheless, this might not be an easy task. Virtual teams are often constructed because organizations require skills, local knowledge, experience, resources, or expertise from employees who are geographically distributed [5]. Organizations can also face particular difficulties in selecting team members who have the balance of technical and interpersonal skills and abilities required to work virtually. Moreover, this can be especially complex when virtual teams are composed of employees who come from different organizations [33,53], or in teams with a short time frame, such as virtual project teams.

The drawbacks of virtual teams composed of members with low EI could be overcome by specifically training these teams to develop team competencies to manage emotions. Team emotional management refers to a team's overall ability to manage members' emotions

and interpersonal relationships [54]. Team emotional management is crucial for developing a positive team atmosphere [51]. Thus, this overall ability to manage emotions influences expressions and displays of emotional cues [55]. Team members' displays of emotions may serve as behavioural cues used by other members to evaluate their immediate environment and synchronize their own emotional displays [56]. Teams with high levels of team emotional management may be better at stimulating, displaying, and maintaining positive emotions and building a positive team climate [54]. Thus, we propose a team emotional management (TEM) intervention to enhance team competencies in expressing, recognizing, and managing emotions, and develop a positive climate that can minimize the negative impact of a team composed of members with different levels of EI. The aim of a TEM intervention is to improve the team's ability to effectively manage emotions while interacting in a computer-mediated communication context [21,54]. As Beranek and collaborators [57,58] suggested, the training the team receives in developing relational links is critical. Learning competencies that allow effective emotional communication and the management of emotional experiences within virtual teams could mitigate the constrictions initially attributed to virtual teamwork.

A TEM intervention for virtual teams would be especially important for teams whose interactions exclusively take place through written communication. In online written communication, the communication medium used by our virtual teams, the lack of vocal cues means that socio-emotional information has to be transmitted through written messages. Thus, in order to manage emotions, virtual team members need to be competent in using verbal resources such as paralinguistic cues, management of timing, and emoticons [59,60]. All these cues play a key role in online communication [61]. Emotional information can be transmitted and managed in online written communication using paralinguistic cues, which can also assist with impression formation [59]. Typographical marks, such as exclamation points, ellipses, and the use of capital letters, add emotional meaning to written messages (e.g., excitement, trailing thoughts, and shouting, respectively) [62]. Emoticons help to clarify, strengthen, or soften the meaning of a written message as an alternative to facial cues found

in face-to-face contexts. Thus, emoticons can serve as markers of a positive attitude, providing information about how a written message is supposed to be interpreted (e.g., following messages that are intended to be humorous). They also strengthen and intensify positive expressions (such as greetings, thanks, compliments, etc.) and temper messages with negative content (such as requests, corrections, rejections, and complaints, etc.) [60]. The use of time, known as chronemics, is another nonverbal cue used when forming impressions in online written communication [62]. The timing of sending and receiving messages (such as pauses or silence; [61]) and the frequency and duration of online interactions [63] influence impression development and provide information that can be interpreted in a variety of ways. For example, an immediate response implies priority and importance [62], whereas if a receiver waits a long time to respond, a message can be interpreted as less credible [61] or indicate superiority of the receiver or a perceived lack of status of the sender [62].

Thus, an online intervention designed to facilitate the use of socio-emotional cues to improve affect management in online written communication would mitigate the impact of team EI composition [58]. Thus, we formulated the following hypotheses:

Hypothesis 2. *A TEM intervention will moderate the relationship between team EI composition and members' satisfaction with the team (Hypothesis 2a), positive affective states (Hypothesis 2b), and negative affective states (Hypothesis 2c), so that the influence of team EI composition will be weaker in teams that receive the intervention.*

2. Materials and Methods

2.1. Sample

The sample was composed of 101 virtual teams with four members each and one virtual team with three members (407 participants). All the participants were undergraduate psychology and labor relations students from two public Spanish universities. Based on Bello

and colleagues [64], the use of a student sample is justified when a study is experimental or longitudinal in nature, is guided by a well-defined theory, and makes sophisticated predictions that are confirmed by the results. In this case, it is likely that the results can be generalized to the target population. Moreover, as Gilson and colleagues pointed out [8], much of the research on virtual teams is conducted with students as participants. Our virtual teams composed of students also met Kozlowski and Bell's [31] criteria for defining a work team in an organizational setting. First, members of each team share common goals and work processes. Second, the functional relationships among team members and their nearness promote team members' social interaction. Third, team members exhibit task interdependence. Finally, team members must coordinate with each other to carry out their tasks. Participants took part in the experiment voluntarily and received course credit for their collaboration. The average age of this study sample was 20.8 years (*SD* = 4.6), and 75.4% of the participants were women. Regarding educational level, 83% had completed secondary education.

2.2 Design and procedure

We conducted an experiment using a mixed factorial design with a between-subjects condition (with vs without intervention) and a within-subjects condition (measurement time: Sessions I-III) to test the study hypotheses. This experiment received formal approval from the institutional Ethics Research Committee of the University. We presented the experiment as a study on innovative teaching practices that would allow participants to learn about working in virtual teams. Hence, participants were not aware of the purpose of the study until the debriefing meeting. Students who were interested in participating in the study attended an informative meeting. In this meeting, they received instructions about the procedure and agreed to participate in the experiment. They signed a written consent for their participation, and they were assured that they could not be identified via this study because we fully anonymized their individual responses.

We randomly assigned participants to one of the 102 virtual teams. All the virtual teams in the study maintained the composition of their members during the entire experiment. Next, we randomly allocated each team to the experimental (teams with intervention) or control condition (without intervention).

Virtual teams had to perform intellective tasks in three work sessions. We adapted three intellective decision-making tasks, following the task model of McGrath [65], which are also called “survival” tasks. They were integrated in a common narrative during the entire experiment through digital storytelling. The three tasks were The Bushfire Survival Situation, a survival in a bunker situation, and Lost in The Desert [66,67]. In each task, team members receive a list of items and objects they have to put in order depending on their usefulness for their survival. To solve the task, participants first made the list individually, and then as a team. They had to combine individual ideas and interact with each other via the written chat in the virtual collaborative space. These tasks have a definitive solution provided by experts as an objective result with which to compare individual and team rankings. These types of tasks are commonly used in experimental studies on teamwork, and they have been found to be very useful for team development [68].

Teamwork carried out during the experimental sessions took place in a virtual collaborative space online in real time. This electronic platform was specifically designed to combine different features of other well-known collaborative tools. Participants received instructions, activities, questionnaires, and messages in this virtual space. They also worked collaboratively on shared documents, and there was a synchronous chat to communicate with the rest of the team members. Participants received guidance for using the chat in order to meet the requirements of the experimental procedure. Therefore, they did not know the identities of the other members, and they were asked to avoid disclosing personal information while participating in the experimental sessions. A pilot study was carried out to test the time required to solve the tasks and the tools used on the software platform.

Virtual teams allocated to the experimental condition (teams with the intervention) received our team emotional management intervention after the first work session. Virtual teams allocated to the control condition (teams without the intervention) received our intervention after the teams had finished the three work sessions (see Figure 1).

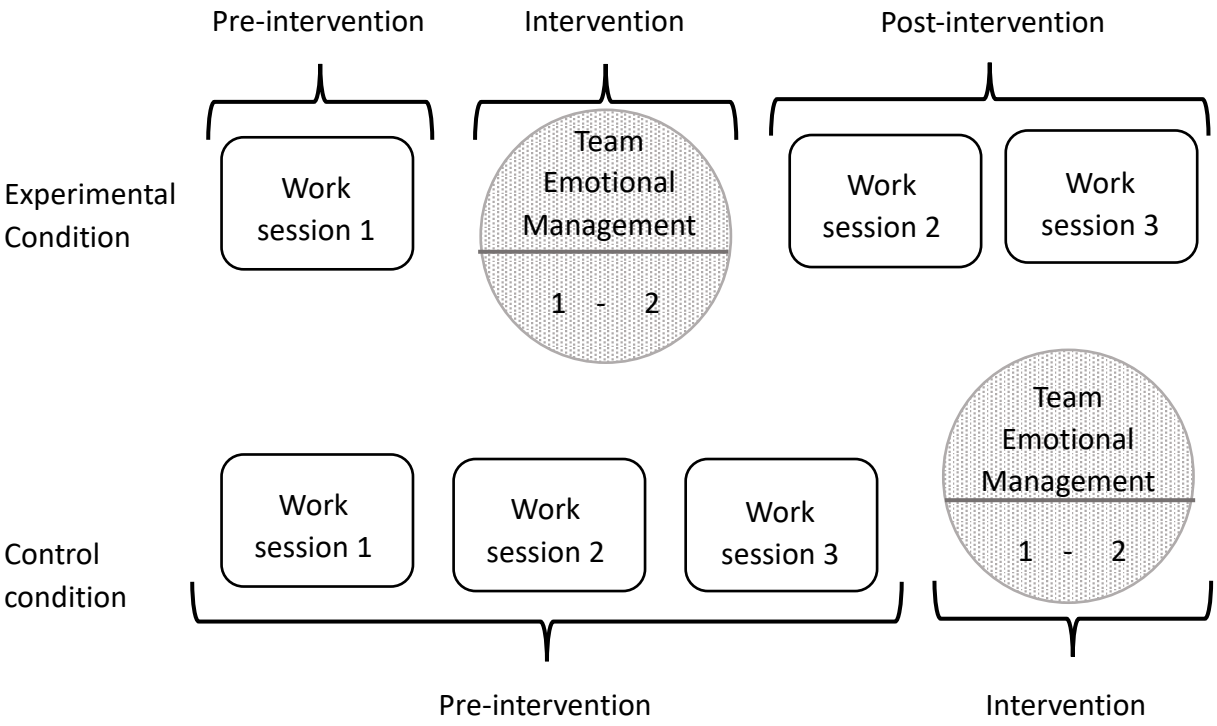

Figure 1. Experimental design of the study.

We administered the Team Emotional Management (TEM) intervention in two training phases in the virtual collaborative space. The first training phase was designed to teach participants how to identify, express, and regulate emotions in virtual teams. We first discussed the importance of socio-emotional factors in virtual teams and work contexts. We taught them about written communication and the visibility of emotions online, the perception of anonymity among participants, and how participants in virtual environments had to construct shared code systems to avoid misunderstandings. Second, we taught them about resources to explicitly express emotions in virtual environments. In this section, we explained

the use of paralinguistic cues (abuse, use of idioms and onomatopoeia, words taken from different languages); the management of temporal resources and chronemic cues (silences, the length of pauses between interactions and interpretation of delays); and the use of graphic symbols and emoticons (e.g., ¯_(ツ)_/¯) to substitute for a message or complete sentence or complement it. These resources were explained by focusing on their role in improving (or deteriorating) the expression and regulation of emotions in virtual environments, due to their impact on the interaction process. Third, we explained what emotional regulation is, and we taught them strategies to implement in virtual environments (e.g., using humor in tense group situations, addressing others by name to feel closer, managing response times when a negative situation is experienced in the team, or re-evaluating a situation, looking for more positive ways to reinterpret a message, etc.) [59,60].

The second TEM intervention training phase focused on managing the emotional climate while working online as a team. We introduced the work session by explaining the importance of a good emotional climate in virtual teams for team performance and other team processes and outcomes. Next, we gave them five strategies to manage emotional climate while participating in a virtual team: (1) acknowledge the effort and contribution of the members, (2) send messages to motivate the team to achieve common goals, (3) reward collective effort and success through written messages, (4) use jokes and humor while working to boost positive feelings, and (5) re-evaluate the situation.

Each phase had two parts. The first part was completed individually and consisted of a brief video-training and practical activities. After all the members of a team had completed this part, in the second part, team members performed a set of group activities that were similar to the previous ones and related to the contents of the individual part. However, they now had to agree on the answers in order to create a common frame of reference for the use of the resources and strategies learnt (e.g., write an example of how you will use emoticons to intensify or soften written messages).

A battery of questionnaires examining the variables of our study was administered at the same points in both conditions. Team EI composition was measured during the informative meeting with participants before the pre-intervention. Satisfaction with the team, and positive and negative affective states were measured at the end of Session 1 and Session 3.

2.3. Measures

Team EI composition. This variable was measured by Carvalho et al. [69] with an adapted version of the Wong Law Emotional Intelligence Scale (WLEIS) Scale. The scale consisted of 16 items rated on a Likert scale ranging from one (strongly disagree) to seven (strongly agree). An example item is "I am sensitive to the feelings and emotions of others". Cronbach's α for this variable was 0.82. Moreover, although measured at the individual level, EI was operationalized at the team level using an additive composition model (team average; [70]).

Satisfaction with the team. This variable was measured with seven items taken from Medina's scale [71], rated on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree). A sample item is "On the whole, I am satisfied with the team". Cronbach's α was 0.94, and 0.97 for Sessions 1 and 3, respectively.

Positive affective states. This variable was measured by six items adapted from Segura and González-Roma [72]. The items were rated on a five-point Likert scale ranging from one (not at all) to five (entirely). An example of an item is "This task made me feel happy". Cronbach's α was 0.86 and 0.91 for Sessions 1 and 3, respectively.

Negative affective states. This variable was also measured with six items adapted from Segura and González-Roma [72]. As on the previous scale, the items were rated on a five-point Likert scale ranging from one (not at all) to five (entirely). An example of an item is "This task made me feel tense". Cronbach's α was 0.69 and 0.77 for Sessions 1 and 3, respectively.

Given that positive and negative affective states and individual satisfaction with the team were measured simultaneously in Sessions 1 and 3, we conducted a confirmatory factor

analysis to ascertain whether items used in the study measured three discriminable factors. The analysis was conducted separately for Session 1 and Session 3. The item covariance matrix was the input matrix, and the model parameters were estimated by means of maximum likelihood methods. Considering that the item distributions departed from normality, we computed the chi-square fit statistic corrected for non-normality. The hypothesized three-factor model showed an acceptable fit to data in Session 1 (X^2/df = 3.25, p < .01; RMSEA = 0.07; CFI = 0.92; TLI = 0.91; SRMR = 0.10) and Session 3 (X^2/df = 2.34, p < .01; RMSEA = 0.06; CFI = 0.96; TLI = 0.95; SRMR = 0.06). We compared the fit of the three-factor model with the fit of an alternative one-factor model that posited that the three dependent variables were not discriminable. The fit of the one-factor model was not adequate in Session 1 (X^2/df = 8.45, p < .01; RMSEA = 0.13; CFI = 0.75; TLI = 0.70; SRMR = 0.13) or Session 3 (X^2/df = 10.17, p < .01; RMSEA = 0.15; CFI = 0.71; TLI = 0.67; SRMR = 0.14). The Satorra Bentler chi-square difference test (TRd) is significant when both models are compared in both sessions (TRd in Session 1= 196.82, Δdf = 3, p < 0.01 and TRd in Session 3= 368.30, Δdf = 4, p < 0.01), providing support for the three-factor model. These results confirmed that the items in our dependent variables measured three discriminable factors.

Control variables. In this study, we controlled the stability effect of our dependent variables (that is, the dependent variable measured in Session 1). Additionally, we controlled the composition of the virtual teams with regard to two variables, university of origin and participants' personal interests when carrying out the "survival" tasks used in the experiment. Information about their interests was obtained through a questionnaire, completed in the informative meeting, that measured two types of survival roles, impulsive or reflexive. Team characteristic was a dichotomous variable indicating the homogeneity of the participants in each team regarding the university of origin and the personal interests of the members. Thus, on the one hand, teams whose members all came from the same university and had similar personal interests, based on the bogus questionnaire, received a score of 0. On the other

hand, teams with two members from each university and different personal interests received a score of 1.

Experimental manipulation check scale. We checked the correct experimental manipulation of the team intervention using a 10-item scale with questions about the contents of the intervention. A sample item is “We used paralanguage signs (e.g., onomatopoeia, capital letters) to qualify our written messages”. Responses were given on a four-point Likert scale ranging from 1 (not at all) to 4 (very much). Cronbach’s α for this scale was 0.89 for Session 3. This scale was also aggregated at the team level. The mean of the $r_{WG(J)}$ was .82 (*SD* = 0.15) for Session 3. ICC(1) was 0.33. Thus, we proceeded to aggregate the data at the team level.

3. Results

3.1. Manipulation check

Using the experimental manipulation check scale, we compared the means in the experimental and control conditions on the use of TEM resources and strategies after interacting together in the work sessions. Results showed that this intervention had the expected effect. Participants’ means in the experimental condition indicated that they used emotional management strategies with their respective teammates more often than participants in the control condition, after receiving the TEM intervention in Session 3 (intervention: M = 3.0; SD = 0.44; control condition: M = 2.7; SD = 0.43; $t_{(100)}$ = -3.42; p < 0.001).

3.2. Preliminary results

Means, standard deviations, and bivariate zero-order correlations are presented in Table 1 (control condition; CC) and Table 2 (experimental condition; EC). Team EI composition was positively related to satisfaction with the team (r_{CC} = 0.27, p < 0.01; r_{EC} = 0.28, p < 0.01) and positive affective states (r_{CC} = 0.15, p < 0.05; r_{EC} = .17, p < .05) in Session 3 in both conditions.

However, this variable was only significantly related to negative affective states (r_{CC} = .30, p < .01; r_{EC} = .06, *n.s.*) measured in Session 3 in the control condition.

Table 1. Descriptive statistics and correlations for the study variables in control condition Teams without intervention.

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1	Team characteristics	-	-	-							
2	Satisfaction with the team S1	4.36	0.70	0.04	-						
3	Positive affective state S1	4.29	0.53	0.15*	0.41**	-					
4	Negative affective state S1	3.76	0.80	0.06	0.31**	0.36**	-				
5	Team EI composition	5.04	0.26	0.15*	-0.05	0.14*	0.11	-			
6	Satisfaction with the team S3	4.43	0.46	0.03	0.19**	0.20**	0.14*	0.27**	-		
7	Positive affective state S3	4.27	0.72	0.11	0.06	0.23**	0.14*	0.15*	0.39**	-	
8	Negative affective state S3	4.30	0.62	0.02	-0.05	-0.26**	-0.24**	0.30**	0.35**	0.57**	-

Note. *p < 0.05; ** p < 0.01; two-tailed. EI = Emotional intelligence; S1 = Session 1; S3 = Session 3.

Table 2. Descriptive statistics and correlations for the study variables in experimental condition: Teams with intervention

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1	Team characteristics	-	-	-							
2	Satisfaction with the team S1	4.37	0.70	-0.03	-						
3	Positive affective state S1	4.24	0.60	0.11	0.50**	-					
4	Negative affective state S1	3.62	0.81	0.04	0.33**	0.24**	-				
5	Team EI composition	5.04	0.32	0.22**	0.01	0.08	0.08	-			
6	Satisfaction with the team S3	4.49	0.52	0.28**	0.27**	0.19**	0.01	0.28**	-		
7	Positive affective state S3	4.45	0.64	0.20**	0.31**	0.44**	0.21**	0.17*	0.36**	-	
8	Negative affective state S3	4.37	0.68	0.13	0.13	0.19**	0.06	0.06	0.31**	0.52**	-

Note. *p < 0.05; ** p < 0.01; two-tailed. EI = Emotional intelligence; S1 = Session 1; S3 = Session 3.

The team characteristics variable was significantly related to satisfaction with the team (r_{EC} = .28, p < .01) and positive affective states in Session 3 (r_{EC} = .20, p < .01) in the experimental condition, supporting the need to control this variable. Moreover, although the students represented a homogeneous group in terms of level of education, we carried out an ad hoc analysis and tested whether participants' gender and age could be affecting our dependent variables. Thus, Box's M statistic was calculated for satisfaction with the team and positive and negative affective states [73,74]. This index allowed us to check whether our data could be combined and analyzed together, considering differences in participants'

gender and age. Box's M statistic tests the null hypothesis, according to which the covariance matrix between the study variables is the same across gender and age. In case of non-significance, it is possible to jointly analyze the data. Regarding gender, the results were as follows: M = 0.08 (p = 0.78) for satisfaction with the team; M = 2.78 (p = 0.10) for positive affective states; and M = 0.03 (p = 0.85) for negative affective states. Regarding participants' age, the results were as follows: M = 5.85 (p = 0.06) for satisfaction with the team; M = 0.05 (p = 0.97) for positive affective states; and M = 0.69 (p = 0.71) for negative affective states. Therefore, data gathered from participants with different genders and ages were combined and analyzed together, given that neither of these variables influenced our dependent variables.

3.3. Hypothesis testing

To test Hypothesis 1, we followed a hierarchical data strategy and examined three nested models using Multigroup Hierarchical Linear Modelling: Null model, Model 1, and Model 2. Prior to testing the hypotheses, it is necessary to determine that there is sufficient variance in the criterion variables at all levels of analysis [75]. Thus, a null model was tested, including the intercept as the only predictor. The null model determined the proportion of variance in satisfaction with the team and positive and negative affective states at Level 1 (within teams) and Level 2 (between teams). The intraclass correlation (ICC) was computed in this model. In Model 1, the control variables (stability effect of the dependent variable and the team characteristics variable) were entered. In Model 2, team EI composition was introduced. We examined the models in the control condition (teams without intervention) and investigated whether there was significant variance in the intercepts and slopes across virtual teams to specify the best fitting random coefficient model.

To test Hypothesis 2, we examined the same nested models in the experimental condition (teams with intervention), and we compared the results for the two conditions.

3.3.1. Satisfaction With the Team as Dependent Variable. Hypothesis 1a and 2a

Regarding the null model, the ICC(1) values were significant in both the control and experimental conditions for satisfaction with the team (ICC(1) = 0.44 and 0.42, respectively), showing that team membership explained a sufficient proportion of variance in this criterion variable.

Hypothesis 1a proposed that team EI composition would influence satisfaction with the team (see Table 3). Considering the control condition, when control variables were entered (Model 1), results revealed that Model 1 showed a significant improvement over the null model (difference of -2*log = 5.54; *df* = 2; $p < 0.01$). Satisfaction with the team measured in Session 1 was positively associated with satisfaction with the team in Session 3 ($\beta = 0.23$, $p < 0.01$). When team EI composition was entered (Model 2), findings revealed that Model 2 showed a significant improvement over Model 1 (difference of -2*log = 3.52; *df* = 1; $p < 0.05$). Team EI composition was positively associated with satisfaction with the team in Session 3 ($\beta = 0.50$, $p < 0.05$). Therefore, Hypothesis 1a was supported.

Table 3. Multilevel estimates for models predicting satisfaction with the team in Session 3.

Variable	Null Model			Model 1			Model 2		
	Estimate	***SE***	***t***	**Estimate**	***SE***	*t*	Estimate	*SE*	*t*
Control condition: Teams without emotional management intervention									
Intercept	4.427	0.0643	68.791**	3.3985	0.2933	11.58**	0.8513	1.1990	0.710
Control Variables									
Satisfaction with the team S1 [a]				0.2339	0.0645	3.627**	0.2418	0.0641	3.772**
TC [b]				0.0089	0.0621	0.144	-0.0103	0.0604	-0.172
Predictor									
EI composition [b]							.5017	0.2297	2.183*
-2*log	409.20			403.66			400.14		
Difference of -2*log				5.54**			3.52*		
Experimental condition: Teams with emotional management intervention									
Intercept	4.492	0.0730	61.501**	2.3456	0.3529	6.645**	0.5675	1.035	0.548
Control Variables									
Satisfaction with the team S1 [a]				0.4204	0.0731	5.747**	0.4200	0.0727	5.777**
TC [b]				0.1532	0.0637	2.405*	0.1279	0.0637	2.006*
Predictor									
EI composition [b]							.3629	0.1994	1.819
-2*log	473.57			445.72			443.85		
Difference of -2*log				27.85**			1.87		

[a] Predictors at the individual level [b] Predictors at the team level *Note*. *$p < 0.05$; ** $p < 0.01$; two-tailed. EI= Emotional intelligence; TC = Team characteristics; S1 = Session 1.

Hypothesis 2a proposed that the influence of team EI composition on satisfaction with the team would be moderated by the TEM intervention. Thus, we tested the same models in the experimental condition. Model 1 showed a significant improvement over the null model (difference of -2*log = 27.85; *df* = 2; $p < 0.01$). Satisfaction with the team measured in Session 1 was positively associated with satisfaction with the team at Time 3 (β = 0.42, $p < 0.01$). Model 2 showed a non-significant improvement over Model 1 (difference of -2*log = 1.87; *df* = 1; *n.s.*). Team EI composition was not significantly associated with satisfaction with the team in Session 3 (*β* = 0.36, *n.s.*). Our findings showed that the effect of team EI composition on satisfaction with the team in Model 2 was significant in the no-intervention condition (*β* = 0.50, $p < 0.05$) and non-significant in the intervention condition (*β* = 0.36, *n.s.*). Therefore, Hypothesis 2a was supported.

3.3.2. Positive Affective Sates as Dependent Variable. Hypothesis 1b and 2b

Regarding the null model, the ICC(1) values were significant for positive affective state in both the control and experimental conditions (ICC(1) = 0.35 and 0.34, respectively), showing that team membership explained a sufficient proportion of variance in this criterion variable.

Hypothesis 1b proposed that team EI composition would influence positive affective states (see Table 4). Considering the control condition, when the control variables were entered (Model 1), the results revealed that Model 1 showed a significant improvement over the null model (difference of -2*log = 3.54; *df* = 2; $p < 0.05$). Positive affective states measured in Session 1 were positively associated with positive affective states in Session 3 (*β* = 0.28, $p < 0.01$). When team EI composition was introduced (Model 2), our findings revealed that Model 2 showed a non-significant improvement over Model 1 (difference of -2*log = 0.98; *df* = 1; *n.s.*). Team EI composition was not significantly associated with positive affective states in Session 3 (*β* = 0.30, *n.s.*). Therefore, Hypothesis 1b was not supported.

Table 4. Multilevel estimates for models predicting positive affective states in Session 3.

Variable	Null Model			Model 1			Model 2		
	Estimate	***SE***	***t***	**Estimate**	***SE***	***t***	**Estimate**	***SE***	***t***
Control condition: Teams without emotional management intervention									
Intercept	4.2678	0.0561	75.987**	3.0011	0.4036	7.435**	1.5336	1.0248	1.496
Control Variables									
Positive affective state S1 [a]				0.2814	0.0941	2.989**	0.2661	0.0945	2.816**
TC b				0.0569	0.0522	1.091	0.0463	0.0520	0.891
Predictor									
EI composition [b]							0.3058	0.1975	1.548
-2*log	443.50			439.96			438.98		
Difference of -2*log				3.54*			0.98		
Experimental condition: Teams with emotional management intervention									
Intercept	4.4509	0.0503	88.379**	2.3783	0.2853	8.333**	1.3531	0.6794	1.992*
Control Variables									
Positive affective state S1 [a]				0.4434	0.0658	6.736**	0.4388	0.0656	6.684**
TC [b]				0.0950	0.0410	2.314*	0.0805	0.0413	1.949*
Predictor									
EI composition [b]							0.2128	0.1288	1.652
-2*log	397.17			357.74			357.30		
Difference of -2*log				39.43**			0.44		

[a] Predictors at the individual level [b] Predictors at the team level *Note*. *$p < 0.05$; ** $p < 0.01$; two-tailed. EI= Emotional intelligence; TC = Team characteristics; S1 = Session 1.

Hypothesis 2b proposed that the influence of team EI composition on positive affective states would be moderated by the TEM intervention. Thus, we tested the same models in the experimental condition. Model 1 showed a significant improvement over the null model (difference of -2*log = 39.43; *df* = 2; $p < 0.01$). Positive affective states measured in Session 1 were positively associated with positive affective states in Session 3 ($\beta = 0.44$, $p < 0.01$). Model 2 showed a non-significant improvement over Model 1 (difference of -2*log = 0.44; *df* = 1; *n.s.*). Team EI composition was not significantly associated with positive affective states at Time 3 ($\beta = 0.21$, *n.s.*). Our findings showed that the effects of team EI composition on positive affective states was non-significant in both conditions. Therefore, Hypothesis 2b was not supported.

3.3.3. Negative Affective States as Dependent Variable. Hypothesis 1c and 2c

Regarding the null model, the ICC(1) values were for negative affective state were significant in both the control and experimental conditions (ICC(1) = 0.30 and 0.31, respectively), showing that team membership explained a sufficient proportion of variance in this criterion variable.

Hypothesis 1c proposed that team EI composition would influence negative affective states (see Table 5). Considering the control condition, when control variables were entered (Model 1), the results revealed that Model 1 did not show a significant improvement over the null model (difference of -2*log = 2.95; *df* = 2; *n.s.*). However, negative affective states measured in Session 1 were positively associated with negative affective states in Session 3 (β = 0.18, p < 0.01). When team EI composition was introduced (Model 2), our findings revealed that Model 2 showed a significant improvement over Model 1 (difference of -2*log = 12.91; *df* = 1; *p* < 0.01). Team EI composition was negatively associated with negative affective states at Time 3 (β = -0.69, p < 0.01). Therefore, Hypothesis 1c was supported.

Table 5. Multilevel estimates for models predicting negative affective states in Session 3.

Variable	Null Model			Model 1			Model 2		
	Estimate	***SE***	***t***	**Estimate**	***SE***	***t***	**Estimate**	***SE***	***t***
Control condition: Teams without emotional management intervention									
Intercept	4.3043	0.0523	82.231**	3.6591	0.2094	17.471**	0.2652	0.8492	0.312
Control Variables									
Negative affective state S1 [a]				0.1779	0.0579	3.363**	0.1651	0.0512	3.221**
TC b				0.0240	0.0556	0.480	0.0497	0.0441	1.126
Predictor									
EI composition [b]							-.6870	0.1684	-4.080**
-2*log	380.43			377.48			364.57		
Difference of -2*log				2.95			12.91**		
Experimental condition: Teams with emotional management intervention									
Intercept	4.3717	0.0523	82.231**	4.0400	0.2410	16.762**	3.7353	0.9041	4.131**
Control Variables									
Negative affective state S1 [a]				0.0412	0.0579	0.712	0.0397	0.0581	0.685
TC [b]				0.0901	0.0556	1.620	0.0858	0.0575	1.492
Predictor									
EI composition [b]							-0.0632	0.1801	-0.351
-2*log	423.19			427.81			429.28		
Difference of -2*log				-4.62			-1.47		

[a] Predictors at the individual level [b] Predictors at the team level. *Note*. *p < 0.05; ** p < 0.01; two-tailed. EI= Emotional intelligence; TC = Team characteristics; S1 = Session 1.

Hypothesis 2c proposed that the influence of team EI composition on negative affective states would be moderated by the TEM intervention. Thus, we tested the same models in the experimental condition. Model 1 did not show a significant improvement over the null model (difference of -2*log = -4.62; *df* = 2; *n.s.*). Negative affective states measured in Session 1 were not significantly associated with negative affective states in Session 3 (β = 0.04, *n.s.*). Model 2 showed a non-significant improvement over Model 1 (difference of -2*log = -1.47; *df* = 1; *n.s.*). Team EI composition was not significantly associated with negative affective states at Time 3 (β = -0.06, *n.s.*). Our findings showed that the effect of team EI composition on negative affective states, tested in Model 2, was significant in the control groups (β = -0.69, $p < .01$) and non-significant in the experimental groups (β = -0.06, *n.s.*). Therefore, Hypothesis 2c was supported.

4. Discussion

The purpose of our study was twofold. First, we investigated the extent to which team EI composition predicted members' satisfaction with the team and affective states in virtual teams. Second, we examined whether a TEM intervention had an impact on these relationships, buffering the effects of team EI composition on individual well-being indicators.

We hypothesized that teams' emotional intelligence composition would influence virtual team members' satisfaction and affective states over the team's lifespan. Few studies have focused on the effects of team emotional intelligence composition on individual and team results (e.g. [31]), and to our knowledge, no study has examined the influence of individual emotional intelligence as a team composition characteristic in virtual teams. We found empirical support for the relationship between team EI composition and members' well-being over time. According to Social Information Processing Theory [48], due to the adaptation of the content and style of messages in online written communication, virtual teams require a longer time span to process and manage collective emotional knowledge and behaviours and

develop successful interpersonal relations [49]. Our findings showed that team EI composition contributes to processing socioemotional information and managing interpersonal links over time. Our results also support theoretical models of team composition effects. These models state that when members, on average, have greater team-related competencies, the team is more likely to function effectively because these competencies facilitate interpersonal interactions [33,35,37]. Nevertheless, team EI composition influenced the change in satisfaction with the team and negative affective states over time, but it did not influence positive affective states. It is possible to find an explanation for these results. Compared to face-to-face teams, virtual team members behave in a more uninhibited, impersonal, and even hostile manner [49]. Because members with high levels of emotional intelligence are probably attuned to their own emotions and the emotions of others, they are able to detect these negative emotions and manage them, in order to enhance the quality of the communication among the members and reduce potential conflicts within the virtual team. Moreover, the lack of negative emotional expressions within virtual teams may be interpreted as a sign of suitable team functioning [25], increasing, in turn, members' satisfaction with the team. Nonetheless, team EI composition did not significantly promote work-related positive states within the virtual team. We expected that individual positive affective states would increase in virtual teams with a high average level of EI over time. We found a possible explanation for this unexpected finding related to the temporary nature of our teams. As mentioned above, computer-mediated communication has an important disadvantage, that is, team members' tendency to behave in a more impersonal, hostile, and less empathic way within the team. These behaviours create an atmosphere of distrust, suspicion, and misunderstanding, hindering team members' connection with each other. In this regard, it is possible that member' efforts to emotionally manage teamwork focus especially on these negative affective states that arise in these first phases of virtual teamwork. It is possible that members working in teams with a relatively short lifespan, as in our teams (one month), prioritise managing members' negative affective states, which could hinder team processes

and the achievement of team goals. Future studies should examine the relationship between team EI composition and members' positive affective states in long-term virtual teams or teams with a more extensive lifespan.

Another main objective of our study was to examine the impact of a team emotional management intervention on the relationship between team emotional intelligence composition and members' well-being. We posited that an online intervention for virtual teams on the use of socio-emotional cues and emotional management strategies applied to text-based communication would moderate the impact of team EI composition. Our results showed that the TEM intervention moderated the relationships between team EI composition and members' well-being (satisfaction with the team and negative affective states), buffering its influence. Thus, the influence of team EI composition was only significant in virtual teams with no intervention, becoming more important in this condition. Our findings support the efficacy of a TEM intervention for managing emotions in virtual teams where members communicate with each other through online written systems. This TEM intervention increased members' competency in using verbal resources such as paralinguistic cues, management of timing, and emoticons to transmit socio-emotional information. Our TEM intervention provided virtual teams with a collective ability to manage expressions and displays of emotional cues during teamwork [56], thus improving interpersonal relationships [54]. Therefore, virtual teams that receive a team emotional management intervention are better at inducing and sustaining positive emotions among team members and building a positive team climate [51]. An unexpected result was that the team emotional management intervention reduced the stability of members' negative affective experiences over time. Whereas there was a positive relationship between negative affective states at Time 1 and Time 3 in the control condition, this relationship disappeared in the intervention condition. Thus, effective emotional management within virtual teams contributes to reducing the initial levels of virtual team work-related tension, nervousness, and anxiety.

4.1. Theoretical and practical implications

One of the strengths of this study is the implementation of a longitudinal design that allowed us to examine our focal variables and their relationships across the virtual team's lifespan, providing a richer understanding of the dynamic and changing emotional nature of virtual teams [32]. Additionally, we used multilevel modelling to analyse the antecedents of individual well-being at the team level and more accurately model virtual teams' emotional phenomena [75].

Overall, the findings reported here have a number of implications for future theoretical developments in virtual team research. First, until recently, the virtual team literature had examined the role of teams' demographic and personality composition as inputs or drivers of virtual teams' effectiveness. Our results extend these findings by examining the impact of teams' emotional intelligence composition. Second, much of the research on emotions in virtual teams has focused on the ways emotions are expressed through computer-mediated communication and the emotional impact of virtual teamwork (e.g. [11,46,76-78]). Nonetheless, few studies have analyzed how to promote a higher level of well-being within virtual teams. Gilson et al., [8], in their review on virtual team research in the past ten years, detected a need for knowledge about how members' well-being is shaped in virtual teams from a multilevel perspective. Our findings show that emotional factors at the team level, such as team emotional intelligence composition, influence individual affective experiences. This result contributes to research on team composition as a structural property of groups [18]. Future studies should extend these findings and examine the role of individual differences between members of a virtual team. Literature on team diversity shows that individual differences in values, beliefs, attitudes, and predispositions have an impact on team members' interactional behaviours and patterns and intergroup relationships [79,80]. Although studies of diversity effects in teams have primarily focused on group-level outcomes, research in other areas allows us to infer that diversity has an effect on emotional regulation and well-being (e.g. [81-83]). In addition, our results show that an online

intervention to develop team competencies to manage teams' emotional environment has an impact on team members' well-being. Third, virtual teams are usually formed based on members' task-related expertise and experience, without considering members' emotional intelligence. Thus, our results show that an intervention based on developing team emotional management is a key element in reducing the potential negative influence when this emotional characteristic is not considered in the team design. Future studies should continue this research line and examine the ability of other collective emotional constructs, such as teams' trait affect composition [18] or teams' emotional openness [50], to improve this individual result in virtual teams. Scholars should also analyse the moderator role of the TEM intervention in influencing other predictors of members' well-being in virtual teams, such as the team leader's emotional intelligence (e.g. [41,78]) or the organizational emotional culture [20].

The increasing use of virtual teams presents a unique challenge in managing human resources [53]. Thus, our findings have several practical implications for organizations. First, from a staffing perspective, organizations that rely on virtual teams should consider integrating emotional intelligence into their current selection system. Moreover, organizations should invest resources in TEM training to increase virtual teams' emotional competence and empower them to more effectively handle the emotional challenges created by the virtual environment. Organizations that offer TEM training may be able to increase awareness and management of the way emotions are expressed in virtual teams, as well as their impact on members' well-being and, ultimately, virtual teams' results. Online TEM training may also help organizations to deal with the potential detrimental effects of teams composed of members with scant emotional skills. During the intervention, work team members receive a short training using audio-visual materials. Then, they practice the training contents through different exercises. For instance, several positive and negative situations that could be experienced during virtual work are presented to team members (e.g., "two team members are arguing while performing a group task"). For each situation, they are asked to indicate

what emotional regulation strategies they would use to maintain a positive team climate and avoid a negative team climate. An online training, as proposed in this study, to improve teams' affective management skills can easily be implemented. Organizations can create a web-based platform to train their employees anywhere and anytime, provided they have Internet access. Finally, given that it is a short online training program composed of two sessions (or blocks of content) lasting one hour each, team members can individually learn and practice at their own pace and convenience within the training time frame, and then agree with other teammates on a time frame for collective practice so that the training does not disrupt their work day.

4.2. Limitations

This study has some limitations. First, the data were based on self-reported measures. Hence, it might be argued that common method variance may have inflated the hypothesized relationships. Nonetheless, we minimized this problem by using aggregated data in our predictor [84] and measuring our focal constructs at different time points [85]. Future studies should consider other data sources, such as group discussion analyses, in order to examine members' interactions and emotional expressions during teamwork. Second, individual satisfaction with the team and affective states could have been influenced by individual personality traits, typically neuroticism and extraversion [86]. Future studies should attempt to replicate our findings, controlling these personality characteristics. Third, our sample was composed of newly formed virtual teams, with a relatively short lifespan (one month). Thus, the temporary nature of our teams limits the generalization of the results to long-term teams. Fourth, our results have some limitations in terms of generalizability to organizational settings because they were obtained in a laboratory with a sample of students. Although there is ample agreement about the capacity of experimental studies to address applied problems in this field, and much of the research on virtual teams is conducted with students [8,87], future studies should try to replicate our results in real organizational contexts. Finally, the findings

of the current study are only generalizable to virtual teams that utilize one type of computer-mediated communication, synchronous communication through electronic text-based chat in real time (i.e., instant messaging) [88]. Because multiple modalities of communication are available for virtual interactions (i.e., e-mail, videoconferencing), our results should be tested in teams that are communicating through different communication media.

5. Conclusions

In conclusion, very little is known about the role of team emotional composition in virtual teams, where, unlike in face-to-face teams, emotional expression cues are relatively limited. Although researchers have unequivocally started to demonstrate that team emotional composition plays a unique role in members' well-being in face-to-face teams, to date, scholars have neglected to investigate the implications of these emotional constructs and their relationships in virtual teams. Our study identifies emotional intelligence as a key driver of virtual team members' well-being, and it highlights the effectiveness of a team emotional management intervention to buffer its impact on virtual teams.

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ESTUDIO 3: Collaboration and Performance in Virtual Teams with Faultlines: An Emotional Management Intervention

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Collaboration and Performance in Virtual Teams with Faultlines: An Emotional Management Intervention

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Abstract

Problem: Virtual teams with faultlines face challenges due to their dispersion, diversity, and virtuality, which can diminish their performance. To resolve this issue, team emotional management (TEM) interventions foster teams' collaboration capability, that is, the team's ability to build and manage relationships based on trust, commitment, and communication. **Goals:** This research aimed to analyse whether a TEM intervention can enhance team performance by improving the collaboration capability in virtual teams with faultlines. **Method:** Fifty-two four-member teams participated in an experiment with repeated measures (three measurement times). Teams were randomly assigned to either a TEM intervention or a control condition. **Main results:** The TEM intervention had a positive effect on trust and commitment, but not on communication. Moreover, trust and commitment fully mediated the effect of the TEM intervention on performance. **Main implications:** Our findings showed the relevance of a TEM intervention in improving the collaboration capability and performance in virtual teams with faultlines. This study contributes to research on faultlines, affect management in virtual teams, and computer-mediated communication.

Keywords: collaboration in virtual teams, emotional management, team performance.

Resumo

Problema: equipes virtuais com subgrupos enfrentam desafios devido à sua dispersão, diversidade e virtualidade, o que pode diminuir seu desempenho. Para resolver esse problema, as intervenções de gerenciamento emocional da equipe (*team emotional management* - TEM) estimulam a capacidade de colaboração das equipes, ou seja, a capacidade da equipe de construir e gerenciar relacionamentos com base na confiança,

compromisso e comunicação. **Objetivos:** Esta pesquisa teve como objetivo analisar se uma intervenção TEM pode melhorar o desempenho da equipe, melhorando a capacidade de colaboração em equipes virtuais com subgrupos. **Método:** 52 equipes de quatro membros participaram de um experimento com medidas repetidas (três tempos de medidas). As equipes foram aleatoriamente designadas para uma intervenção TEM ou uma condição de controle. **Principais resultados:** A intervenção TEM teve um efeito positivo na confiança e no compromisso, mas não na comunicação. Além disso, a confiança e o compromisso mediaram totalmente o efeito da intervenção TEM no desempenho. **Principais implicações:** Nossos resultados mostraram a relevância de uma intervenção TEM na melhoria da capacidade de colaboração e desempenho em equipes virtuais com subgrupos. Este estudo contribui com a pesquisa sobre subgrupos, gerenciamento de afeto em equipes virtuais e comunicação mediada por computador.

Palavras-chave: colaboração em equipes virtuais, gestão emocional, desempenho de equipe.

Resumen

Problema: los equipos virtuales con subgrupos afrontan desafíos debido a su dispersión, diversidad y virtualidad, lo que puede disminuir su desempeño. Para resolver este problema, las intervenciones en gestión emocional en equipo (TEM) fomentan la capacidad de colaboración de los equipos, es decir, la capacidad del equipo para construir y gestionar relaciones basadas en la confianza, el compromiso y la comunicación. **Objetivos:** esta investigación tuvo como objetivo analizar si una intervención TEM puede mejorar el desempeño del equipo al mejorar la capacidad de colaboración en equipos virtuales con subgrupos. **Método:** Cincuenta y dos equipos de cuatro miembros participaron en un experimento con medidas repetidas (tres tiempos de medida). Los equipos fueron asignados al azar a una intervención TEM o una condición de control. **Resultados principales:** La intervención TEM tuvo un efecto positivo en la confianza y el compromiso, pero no en la comunicación. Además, la confianza y el compromiso mediaron completamente el efecto de la intervención TEM sobre el desempeño. **Implicaciones principales:** Nuestros hallazgos mostraron la relevancia de una intervención TEM para mejorar la capacidad de colaboración y el desempeño en equipos virtuales con subgrupos. Este estudio contribuye a la investigación sobre subgrupos, gestión del afecto en equipos virtuales y comunicación mediada por ordenador.

Palabras clave: colaboración en equipos virtuales, gestión emocional, desempeño de equipo.

Technological developments and greater complexity in organizations due to globalization have increased the use of virtual teams (Gilson et al., 2015; Hahn & Lee, 2017). Members of virtual teams must solve complex problems and work towards common goals through computer-mediated communication (Dulebohn & Hoch, 2017). They are geographically and/or temporally dispersed, and they usually have different cultural backgrounds (Jarvenpaa & Leidner, 1999). Thus, diversity is both a key characteristic and a potential strength of virtual teams (Han & Beyerlein, 2016). Based on the information/decision-making perspective, team members' different backgrounds produce a broad pool of knowledge, expertise, and experiences that can stimulate innovation and performance. However, the diverse characteristics of team members can also be a source of impediments to team performance (van Knippenberg & Mell, 2016), especially in virtual teams, due to the reduced availability of personal and contextual cues (Altschuller & Benbunan-Fich, 2010). The perception of similarities with some team members and differences from others could trigger negative affect and in-group/ out-group biases. Consequently, participants show positive feelings and responses only to their subgroup (van Knippenberg & Mell, 2016). This phenomenon, known as diversity faultlines, occurs when two or more perceived diversity characteristics align in a team (Lau & Murnighan, 1998). Faultlines are hypothetical dividing lines that split virtual teams into subgroups, eliciting inter-subgroup bias that inhibits interpersonal dynamics (Gibbs et al., 2017), increases psychological distance among participants, and harms team collaboration processes and performance (Bjørn & Ngwenyama, 2009; Hogg & Terry, 2000; Jehn & Bezrukova, 2010).

Prior research tried to find strategies to mitigate the negative effects of faultlines (e.g. Rico et al., 2012). To do so, the role of emotions within teams is crucial (Chang et al., 2012). For example, positive emotions boost teamwork because they lead to collaborative behaviour

among members due to emotion contagion (Diener et al., 2020), increasing perceived performance (Barsade, 2002). Similarly, Grandey and Melloy (2017) propose that in work contexts with high levels of interaction (e.g. virtual teams), emotion regulation becomes essential to long-term performance. The proper management of group affect (i.e., creation of shared understandings and norms for emotion regulation) could bridge diversity faultlines and increase performance in compute-rmediated communication contexts. In this regard, prior research highlights the numerous benefits of emotions and emotional management in virtual teams (e.g. Mysirlaki & Paraskeva, 2020; Quisenberry, 2018). Moreover, emotional management could be a key tool to manage the consequences of the Coronavirus Disease 2019 (COVID-19) for workers (Restubog et al., 2020), and so TEM training becomes necessary. Thus, in this study we train team members to manage emotions in virtual environments. We argue that reducing psychological distance between the subgroups facilitates the development of collaborative capabilities that are necessary for team effectiveness (Bjørn & Ngwenyama, 2009). Consequently, team members will develop relational-oriented capabilities that improve their functioning, such as team collaboration capability, composed of trust, commitment, and communication (Altschuller & Benbunan-Fich, 2010; Batarseh et al., 2017; Blomqvist & Levy, 2006).

Thus, this research has a dual objective. First, we study the influence of a Team Emotional Management (TEM) intervention on team performance in virtual teams with faultlines. Second, we analyse the mediating role of Team Collaboration Capability (composed of trust, commitment, and communication) in the relationship between the TEM intervention and performance.

TEM Intervention & Team Performance in Virtual Teams

Teams' ability to competently manage emotions is essential for team effectiveness (Meng et al., 2015; Michinov & Michinov, 2020). In virtual teams, effectiveness has gained relevance

as team complexity has increased (Mathieu et al., 2019). Effectiveness of teams can be studied in many ways (Mathieu et al., 2017), and it includes both direct results and team perceptions of the results and functioning of the group (García-Buades et al., 2019; Salas et al., 2005). The evaluation of effectiveness based on team members' views is relevant because the virtual environment is complex and influences performance outcomes. Thus, it is important to know how team resources have been used, the strategies applied, and the efficiency in achieving the goals (Zornoza, 2013). Thus, we define team performance as the members' perception of the way the team has obtained the outcome and its quality.

Prior research linked emotion management in groups and teams to important outcomes such as team viability, proper decision-making, satisfaction, conflict reduction, and team performance (Chang et al., 2012; Costa et al., 2015; Diener et al., 2020; Michinov & Michinov, 2020). Members' emotional states are mimicked by other members due to the group interaction, generating an "emotional spiral" among members (Ashkanasy & Dorris, 2017). Therefore, to be effective, teams need to create attitudes and behaviours that can identify and process emotions at the group level (Michinov & Michinov, 2020). Thus, team members must be aware of the emotions of other members and the group's emotions or moods and manage them collectively (Druskat & Wolff, 2001). Emotion management further facilitates effective communication, trust, and, in turn, performance in teams (Barsade & Knight, 2015; Chang et al., 2012; Diener et al., 2020; Quisenberry, 2018).

Despite this, emotion management in virtual teams has hardly been studied, due to the difficulty of detecting and measuring emotions in computer-mediated communication contexts (Derks et al., 2008; Pitts et al., 2012). According to cues filtered-out approaches (Culnan & Markus, 1987), the lack of nonverbal cues is detrimental to the development of online relationships among members (Derks et al., 2008). Thus, emotions in virtual teams are complex to manage because technology can hinder interactions among participants, and these interactions are a key trigger of emotions (Johnson et al., 2009). Contrary to this

perspective, Social Information Processing (SIP) theory argues that computer-mediated communication can convey affective information and relational communication even though nonverbal cues are less available (Walther, 2015; Xu & Liao, 2019). The expression of emotions and exchange of social information about how we feel still take place, but through other means. Therefore, according to SIP theory, participants in virtual environments exchange socio-emotional information through the content, style, and timing of their verbal messages online. The main principles of the theory are: first, the interchangeability of cues, which means that team members use any available resources to adapt cues to the environment where they operate; and second, the exchange of social information and relational communication takes more time than in face-to-face interactions (Walther, 2015). Hence, team members in computer-mediated communication contexts need to be competent in using verbal resources to express and manage socio-emotional information such as paralinguistic cues and emoticons, as well as in managing time (Derks et al., 2008; Kalman et al. 2013; Skovholt et al., 2014; Walther, 2015).

In the current study, we implement a TEM intervention for virtual teams. The aim of this intervention is to develop the effective expression and regulation of emotions and affective states of virtual team members through written interactions. Past research highlights the importance of interventions for developing team skills (Lacerenza et al., 2018) and emotional management for team results (Quisenberry, 2018). Interventions are common in virtual environments because the competences of workers in face-to-face environments do not always transfer to the virtual context. Thus, specific training programs on how to work in virtual teams have been developed. For example, Godin et al., (2017) combined technology acceptance and virtual teamwork training models to teach participants to use an online tool for teamwork. Martínez-Moreno et al. (2015) developed a training program for virtual teams based on process and result feedback that improved conflict management. However, there is a research gap in the training literature on emotion management because many previous team interventions omitted emotions or aimed to remove emotions from teams (Druskat &

Wolff, 2001). Previous research viewed emotions as obstacles to team effectiveness (Kelly & Barsade, 2001). However, we argue that because TEM is inhibited by the characteristics of the team (faultlines) and the restrictions of the medium (computer-mediated communication), helping teams to manage their emotions in order to build a positive social and emotional context will foster team collaboration and strong team effectiveness.

A TEM intervention will allow teams to regulate their work emotional climate, thus improving wellbeing and performance (Jordan & Ashkanasy, 2013). Past research noted that the proper use of emotions while working in teams helps members to re-allocate team resources to focus on significant tasks (Joseph & Newman, 2010). Similarly, teams whose members know how to manage their emotions collaborate more, trust their teammates, experience less conflict, and use adequate strategies to improve team performance (Chang et al., 2012; Jordan & Troth, 2004). Field studies also show that team members who manage their emotions increase project management performance (Turner & Lloyd-Walker, 2008).

Moreover, teams with faultlines deal with an additional challenge regarding group affect (Carton & Cummings, 2012). Subgroups reduce team identification and increase conflict and negative emotions among team members (Chang et al., 2012; Jehn & Bezrukova, 2010), ultimately reducing TEM and team effectiveness (Carton & Cummings, 2012). Consequently, a TEM intervention is especially important for overcoming barriers associated with faultlines, and it will increase performance in virtual teams with faultlines. In this context, we study the effect of an intervention for promoting TEM on team performance in virtual teams with faultlines. Accordingly, we propose the following:

Hypothesis 1. The TEM intervention will increase the level of team performance in virtual teams.

The Mediating Role of Team Collaboration Capability

Team-based collaboration is of primary importance in leveraging effectiveness and contributing to the success of the team (Batarseh et al., 2018; Cole et al., 2019). Moreover,

the importance of the collaboration capability is accentuated under conditions of complexity and uncertainty (Blomqvist & Levy, 2006), such as in computer-mediated communication contexts (Romero et al., 2009). Thus, due to the characteristics of virtual teams with faultlines (interaction through computer-mediated communication tools, member and/or temporal dispersion, alignment of diversity characteristics), collaboration becomes essential. Collaboration capability could help to reduce the interaction breakdowns and psychological distance that can appear in virtual teams (Bjørn & Ngwenyama, 2009). Based on a relational framework (Blomqvist & Levy, 2006), collaboration capability is built on the team members' ability to establish personal links with each other in a way that optimizes team resources (Batarseh et al., 2017).

In this way, collaboration capability involves social interaction among team members in terms of integration, compromise, and open communication (Romero et al., 2009). Collaboration capability provides a way to create shared meaning and understanding about how the team could handle interactions in a computer-mediated communication context (Bjørn & Ngwenyama, 2009). It facilitates the exchange of resources and information, producing mutual gains among team members and helping the team to achieve goals that would not be possible if attempted individually (Blomqvist & Levy, 2006; Romero et al., 2009). Moreover, collaborative capability could mitigate the negative effects of faultlines. The display of collaborative behaviours and processes could reduce identification with the subgroup and bring teammates closer to each other. Thus, to enhance the beneficial effects of diversity on virtual team outcomes, team members could develop relational-oriented collaborative capability (Batarseh et al., 2018).

Therefore, collaboration capability has been attracting considerable interest in recent computer-mediated communication and team literature (Batarseh et al., 2017, 2018). A large body of research points to different specific factors that compose collaborative capabilities (Jarvenpaa & Leidner, 1999; Morgan & Hunt, 1994). In an overview, Blomqvist and Levy (2006) identified successful collaborative skills in teams as Team Collaboration Capability

(TCC), defined as the team's ability to build and manage relationships and interactions based on trust, commitment, and communication (Blomqvist & Levy, 2006). In this study, we draw on the multi-dimensionality of TCC (Blomqvist & Levy, 2006; Ulbrich et al., 2011) and conceptualize it as three relational variables (trust, commitment, and communication) that would influence the management of relationship quality among members and benefit performance (Blomqvist & Levy, 2006).

First, team *trust* is the level of confidence among team members (Haines, 2014; Pinjani & Palvia, 2013). Trust is essential in virtual teams with faultlines because virtual environments are perceived as particularly ambiguous and uncertain, and faultlines promote social competition within the team (Jehn & Bezrukova, 2010). However, trust reduces these perceptions. It makes members more prone to risk-taking behaviours that facilitate interpersonal interaction, such as sharing information, confronting inadequate decisions, or mutual feedback. Trust makes team members vulnerable to other members on the basis that their behaviours will benefit the team (Breuer et al., 2016). This, in turn, facilitates coordination of personal resources and improves performance (Alsharo et al., 2017). In brief, it is a critical factor in virtual teams' success and effective collaboration (Breuer et al., 2016; Breuer et al., 2020).

Second, we define team *commitment* as an affective bond that compels team members to take a relevant course of action (Batarseh et al., 2017). Commitment shows a strong, positive correlation with team performance (Meyer & Herscovitch, 2002). Members of virtual teams with high commitment will experience higher group belonging and caring for the team, encouraging other members to become involved in common goals (Haines, 2014) despite the presence of faultlines.

Finally, team *communication* is a relational factor that is essential to performance in virtual teams (Altschuller & Benbunan-Fich, 2010; Marlow et al., 2018). Communication promotes collaborative processes by helping to coordinate collective effort and facilitating knowledge flow. It is also the way to obtain information about members' visibility and their ability to

achieve goals, engage, and support the team (Lester et al., 2002). Therefore, communication smooths interactions and facilitates relationship building and the creation of a supportive climate, which makes it necessary for performance.

In sum, the three factors that encompass TCC will benefit performance. However, it is not clear how TCC can be promoted in virtual teams. Past research found that emotion management is a strategy to support collaborative capabilities in face-to-face and virtual teams (Cole et al., 2019). Team members who know how to express their emotions during virtual interactions help group-based positive moods and emotions to appear that affect specific collaborative capabilities and increase performance. Kerr et al. (2006) suggested that interpersonal processes characterized by open communication and a sense of trust are created through the adequate management of emotions (Kerr et al., 2006). Additionally, the appearance of positive emotions and a proper team climate has been related to commitment in teams (Kelly & Barsade, 2001).

In conclusion, the extant research highlights the positive effect of emotion management on collaboration and team effectiveness (Jordan & Ashkanasy, 2013; Romero et al., 2009). Following this rationale, we implement an intervention to enhance team competences to better express, recognize, and manage emotions at the group level and develop a positive climate in computer-mediated communication environments. We argue that it will improve TCC (trust, commitment, and communication), which in turn will increase team performance. Therefore, we propose the following:

Hypothesis 2. Team Collaboration Capability (Trust (H2a), commitment (2b), communication (2c)) will mediate the effect of a TEM intervention on team performance.

Method

Participants

The sample consisted of 52 virtual teams with 4 members each (208 participants). Participants were bachelor-level students from Spain enrolled in organizational behaviour

courses. The sample was composed of 30.8% men (*N* = 64) and 69.2% women (*N* = 144). The mean age was 20.9 years (*SD*= 5.3). We recruited the sample by introducing participation in the experiment as an innovative approach to the course contents that would improve their skills in working in computer-mediated communication contexts. Membership was stable during the experimental period, and participants were not allowed to contact their teammates outside the experimental sessions.

Design. We conducted a randomized pre-post design with a control group: we had a 2 x 3 design (2 between-subject: TEM intervention or control condition; and 3 within-subject: pre-intervention session (time 1) and 1st and 2nd post-intervention sessions (times 2 and 3)). Virtual teams were randomly assigned to either the experimental or the control condition. However, the university of origin was used to create the faultline, and so we balanced the participants on the teams so that two members came from one university and two came from the other.

Instruments

Team trust. We used an adapted version of the trust in peers scale by Haines (2014). The scale was composed of five items rated on a six-point Likert-type scale. The possible answers ranged from one *(strongly disagree)* to six *(strongly agree)*. An example item is "I can rely on my other group members to achieve what is expected of them". The Cronbach alpha for this scale was .96.

We measured this variable at the individual level asking for the individual perceptions, but participants worked in virtual teams. Therefore, we aggregated individual responses at the team level following a direct consensus model (Chan, 1998). We checked the adequacy of this process by calculating different indexes that support aggregation at the time points under study. In this case, we used team trust measured at time 2. First, *r*wg(j) was calculated to assess within-group agreement (James et al., 1984). The value of *r*wg(j) was .87 (*SD*=.24), which is above the accepted threshold of .70 (O'Neill, 2017). To further support aggregation, we calculated the AD Index, which also evaluates interrater agreement (Burke & Dunlap,

2002) for the main variables of the study. The value was .80 (*SD*= .35), which is below the cut-off point of .83 for this scale, based on the number of response options (Burke & Dunlap, 2002). We also calculated the intraclass correlation 1, ICC(1), which represents the proportion of total variance that can be explained by group membership (Bliese, 2000). ICC(1) was .08. According to different authors, values above .05 meet the established cut-off point to aggregate values (Bliese, 2000).

Team commitment. This variable was measured by four items used in Batarseh et al., (2017). The items were measured on a six-point Likert scale ranging from one *(strongly disagree)* to six *(strongly agree)*. An example item is "Team members feel as if the team's problems are their own". We used this variable measured at time 2. The Cronbach alpha was .94. This variable was also aggregated using a referent-shift consensus model (Chan, 1998), so that the items used the team as referent for the questions. The data aggregation results were .71 (*SD*=.32) for *r*wg(j). The AD index was .52 (*SD*=.37), which is below the cut-off point of .66 for this scale. ICC(1) was .08.

Team communication. This variable was measured by eight items used by Lester et al., (2002). The items were measured on a six-point Likert scale ranging from one (*strongly disagree*) to six (*strongly agree*). An example item is "the members of my team are very willing to share information with other team members about our work". We used this variable measured at time 2. Results of the reliability test indicated good reliability, with a Cronbach's alpha of .95. Regarding data aggregation results based on a referent-shift consensus model, for *r*wg(j) the value was .94 (*SD* = .14). AD index was .48 (*SD*= .25), which is below the cut-off point of 1.3 for this scale. ICC(1) was .17.

Team performance. This scale was adapted from the EADG-II scale (Dimas et al., 2016). It evaluates performance of teams that work on non-routine tasks (i.e. tasks that involve few standardized processes, with unforeseeable results, or that require solving complex or ambiguous problems). The scale was composed of eight items rated on a ten-point Likert scale ranging from one *(bad)* to ten *(excellent)*. An example item is to rate the "quality of the

work produced". In this case, we used team performance measured at times 2 and 3 to test Hypothesis 1 and also aggregated it to the team level using a referent-shift consensus model. Cronbach's alpha was .96 for time 2 and time 3. This scale was also aggregated at the team level. *r*wg(j) was .91 (*SD*= .19) for time 2 and .92 (*SD*= .17) for time 3. The AD indices were .92 (*SD*: .43) for time 2 and .8615 (*SD*: .4438) for time 3, which are below the cut-off point of 1.3 for this scale. Regarding ICC(1), it was .13 and .18 for times 2 and 3, respectively.

Considering the aggregation indexes together, we decided to further aggregate all the scales to the team level (Bliese, 2000).

Data Collection Procedures and Ethical Considerations

All the participants were geographically distributed; thus, the experiment was conducted in an online environment designed *ex professo* for this research. It was an interactive and synchronous computer-mediated communication platform. It allowed instructions for participants to be displayed, as well as video broadcasts and the use of questionnaires and interactive documents by team members. It also included a live chat with emoticons. Teams had to meet on a weekly basis to participate in the sessions (one-week time lag between sessions, either experimental or intervention sessions). They did three experimental sessions and two TEM intervention sessions. We performed a pilot study to test the time required during each session to solve the tasks and activities on the computer-mediated communication platform. All the teams performed the same tasks and activities. However, the order was modified so that the experimental condition received the TEM intervention after the first session. Teams in the control condition were a wait-list control group, and so measures were taken after each experimental session, and then this group received the intervention for ethical reasons.

Participation was voluntary and proposed to fulfil part of the course requirements, and participants received course credit for it. We held an informative meeting where all the participants signed a participation form approved by the ethics committee of the University.

In this session, we also taught participants how to use the computer-mediated communication platform.

During the experimental sessions at times 1, 2 and 3, participants performed three "survival" tasks integrated with digital storytelling. These types of activities are considered intellective decision-making tasks, based on McGrath's (1984) circumplex model of group tasks. They have been used in experimental and applied contexts with teams (e.g., Chiu & Staples, 2013; Jordan & Troth, 2004). The Survival situations are presented first individually and then to the team. They must put a list of items in order according to their usefulness for facing the challenging situation. To do so, team members have to combine individual efforts and analyse the situation together, developing team processes that help them to achieve an optimum response. Specifically, we used adapted versions of *Bushfire survival* (Human Synergistics, 2018) for time 1; a fallout shelter task (Chiu & Staples, 2013) called "*survival in a bunker*" for time 2; and finally, *lost in the desert* (Lafferty et al., 1974) for time 3. On each task, participants had 10 minutes to order the items individually and 35 minutes for doing so as a group. After each session, data on all the variables used in this study were collected.

Team emotional management intervention. The TEM intervention was composed of two intervention sessions, each of which was divided into an individual exercise and a collective session. Each individual exercise lasted 25 minutes, and each collective session lasted 40 minutes. During the individual exercise, the participants learnt the content and applied it to specific problem-based activities. This exercise was performed on the computer-mediated communication platform to ensure that the compulsory individual activities were finished by all the team members before moving on to the next step. Then, in the group sessions, the whole team worked together on implementing the knowledge and skills learnt during the individual exercises. The first group session referred to the identification, expression, and regulation of emotions in virtual teams (i.e. paralinguistic cues, chronemics, and the proper use of emoticons to modulate the expression of emotions) (Kalman et al., 2013; Skovholt et al., 2014). The second session focused on training members in the

management and regulation of the affective climate while interacting online (through strategies such as offering rewards to teammates who perform well, acknowledging contributions, re-evaluating negative situations, or supporting the team to shared goals). We conducted a manipulation check after completing each experimental task to ascertain that the intervention had been correctly perceived. Participants responded to a 10-item questionnaire about the contents of the intervention and its implementation during the session, with behavioural indicators based on the explanations of the training.

Faultlines. To create the faultline, we performed a series of experimental manipulations to split virtual teams into subgroups of two participants each. This study created faultlines by aligning a characteristic called the "adventure profile" (thoughtful or bold profile) and their university of origin (University of Seville or Valencia). To assign the adventure profile, participants filled in a questionnaire where they indicated their preferences about a series of leisure activities. Some of them were more reflexive activities (thoughtful profile), whereas others were chosen by people more prone to risk (bold profile).

Moreover, based on previous literature (e.g. Rico et al., 2012), the faultline was activated by means of visual hints that communicated their differences. Participants had profile pictures with the colours and logos of their universities, as well as their adventure profiles. Moreover, we explicitly told them their own and the other subgroups' profiles in the pre-intervention session. We then conducted a manipulation check of identification with the subgroup to verify the correct perception of the assigned profile. This was done by explicitly asking to what extent they identified with their subgroup. To further strengthen the role of the faultline, we conducted a warm-up exercise. It was a zero-sum game that had to be played during the pre-intervention session. In this exercise, team members had to distribute economic resources between the two universities, but without giving 50% to each university. Finally, the participants first performed the first experimental task in couples within their subgroup, with the goal of emphasizing the perception of faultlines. In this case, they had 10 extra minutes

to agree on the first part because the subgroups had to discuss the order before moving on to the group ordering.

Data Analysis Procedures

We carried out a set of preliminary analyses before testing the hypotheses. We also checked the validity of the measures through confirmatory factor analyses (CFA) to determine the ability of a predefined theoretical model to fit our empirical data (Brown, 2015). Due to the ordinal nature of our variables, we ran CFA by means of Mplus V7.4 using WLSMV estimation (Byrne, 2012).

Hypothesis 1 was tested using SPSS statistics V24. We proposed ANCOVA models to see whether there were differences between the two conditions (TEM intervention and control condition) in performance, using the measures at times 2 and 3 and controlling for time 1. Hypothesis 2 was tested by means of mediation analysis with the Process Macro for SPSS V3.4. Specifically, we ran process model 4 and entered TEM as the independent variable, each of the individual components of TCC as mediator, and team performance as dependent variable. In this study, TEM intervention was a dichotomous variable; teams in the control condition were assigned scores of zero, whereas teams in the experimental condition were assigned scores of one. We evaluated the indirect effects by means of the Bootstrapping approach. We obtained 5000 bootstrapped samples, creating a 95% bias-corrected confidence interval (CI). This test does not assume the distribution of the data to be normal, and it solves the problems associated with previous tests. When the CI does not include zero, the indirect effect is statistically significant and mediation exists.

Following the guidelines for mediation models, and based on the rationale for our model, the predictor variable was a condition created at time 1, mediating variables were measured at time 2, and the criterion variable was measured at time 3. We also controlled for the mediating and dependent variables at time 1, avoiding artificially augmented estimates of the causal paths of interest (Cole & Maxwell, 2003). In order to assess the model fit of the CFA and mediation models, we examined different goodness of fit statistics: the comparative fit

index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and Weighted Root Mean Square Residual (WRMR). The classic cut-off values to conclude that there is good fit between the model and the observed data are close to 0.95 for CFI and TLI, close to 0.06 for RMSEA, and around 1 for WRMR (Byrne, 2012).

Results

Preliminary Analyses

Table 1 presents means, standard deviations, and Pearson correlations for the aggregated scores for the variables under analysis.

Table 1

Means, Standard Deviations, and Correlations for Study Variables

Variables	Mean	*SD*	1	2	3	4	5
1. Team trust T2	5.31	.49	(.96)				
2. Team commitment T2	4.57	.66	.66**	(.94)			
3. Team communication T2	5.3	.48	.78**	.78**	(.95)		
4. Team performance T2	8.54	.84	.77**	.66**	.81**	(.96)	
5. Team performance T3	8.7	.88	.57**	.41**	.53**	.69**	(.96)

Note. **p< .01 (two-tailed). Inter-item reliability values are in parentheses along the diagonal.

The table shows that the variables that compose TCC were measured at a concurrent time point (T2) and show high to very high inter-correlations. Thus, we ran a CFA to ascertain that TCC can be considered multi-dimensional in nature (Blomqvist & Levy, 2006) in our sample. We aimed to test the three-dimensional factorial structure to use it further in our analyses.

Therefore, as Byrne (2012) suggested, we conducted CFAs to check whether the set of items in each construct were measuring distinguishable variables (although correlated with the other variables) or were part of a single construct (TCC). We checked the different fit indexes (RMSEA, CFI, TLI, WRMR) in a three-factor model (items load in three different factors: trust, commitment, and communication) in comparison with an alternative one-factor model (all the items loading in a single global factor, TCC). We also tested the discriminant validity using a two-step approach. We compared the three-factor model with a constrained model with the correlations among the construct dimensions set to 1, as Anderson and Gerbing (1988) suggested.

The results of the CFAs are presented in Table 2. Only the three-factor model showed a good fit to the data according to the cut-off criteria (Byrne, 2012). Neither the one-factor model nor the constrained models met the cut-off points, and thus we used trust, commitment, and communication as three separate variables. We conducted a Chi Square Difference Test between nested models, and the results were satisfactory ($\Delta\chi^2 = 258$, $\Delta df = 6$, $p<.001$).

Table 2

Confirmatory Factor Analyses

Model	X^2/df	*p*	RMSEA	CFI	TLI	WRMR
Three-factor model	1.7	<.001	.06	.99	.99	.63
One-factor model	7.3	<.001	.17	.97	.96	2.3
Three-factor constrained model	9.9	<.001	.20	.96	.95	3.1

Manipulation Check Results

A specific scale was used to check whether the TEM intervention had been perceived. A sample item is "We used emoticons to smooth the written messages". The items were measured on a four-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Cronbach's alphas for this scale were .81 in the pre-intervention session (time 1), .87 in the post-intervention session (time 2), and .89 in the 2nd post-intervention session (time 3). As in

the previous scales, we also aggregated the data at the team level (Bliese, 2000). The mean for the *r*wg(j) was .85 (*SD* = 0.11) in the pre-intervention session, .84 (*SD* = 0.12) in the post-intervention session, and .82 (*SD* = 0.16) in the 2nd post-intervention session. The ICC(1) also showed adequate values, with a value of .22 in the pre-intervention session, .37 in the post-intervention session, and .38 in the 2nd post-intervention session. Thus, aggregation was justified. In this manipulation check, we compared the means of the experimental and control conditions on the use of TEM strategies while interacting together. Results showed that, as Table 3 shows, participants in the experimental condition used resources and strategies to manage their emotions during the virtual interaction more often than participants in the control condition in the post intervention session ($t(50) = 2.33$; $p < .01$) and in the 2nd post-intervention session ($t(50) = 3.73$; $p < .001$). As expected, there were no significant differences between groups in the pre-intervention session ($t(50) = -1.40$; *ns*).

Table 3

Means and Standard Deviations of Each Condition in the Three Experimental Sessions

Session	Experimental	Control
Pre-intervention session	2.45 (*SD* = 0.55)	2.59 (*SD* = 0.56)
Post-intervention session 1	2.84 (SD = 0.47)	2.55 (*SD* = 0.43)
Post-intervention session 2	3.03 (*SD* = 0.49)	2.57 (SD = 0.40)

Regarding identification with the subgroup, we also checked the participants' identification with their assigned adventure profiles. Team members with the thoughtful adventure profile identified more with their profile ($M = 4.63$; $SD = 1.12$) than with the bold profile ($M = 3.33$; $SD = 1.41$) ($t(103) = 8.03$; $p < .001$). Likewise, team members with the bold adventure profile identified with their assigned profile ($M = 4.39$; $SD = 1.22$) more than with the thoughtful profile ($M = 3.95$; $SD = 1.34$) ($t(103) = 2.39$; $p < .05$). Therefore, participants correctly identified with the made-up characteristic that was part of the faultline.

Hypothesis Testing

In the case of Hypothesis 1, the results show that performance is higher in the experimental condition at both time 2 and time 3 than in the teams in the control condition (see Table 4). However, ANCOVA results show no significant differences between conditions at time 2 ($F(1,49)= 3.64$, $p=.06$) or time 3 ($F(1,49)= 1.32$, *ns*). Thus, Hypothesis 1 is not supported.

Table 4

Means and Standard Deviations of Team Performance Depending on the Condition (TEM Intervention or Control Group).

Variables	Mean (*SD*)	
	Intervention	Control
Team performance (Time 1)	8.03 (1.10)	8.2 (0.78)
Team performance (Time 2)	8.75 (0.70)	8.34 (0.92)
Team performance (Time 3)	8.82 (0.67)	8.58 (0.88)

Regarding Hypothesis 2, results of the mediation analyses show that TEM intervention was significantly related to trust ($b= .27$, $p<.05$) and commitment ($b= .39$, $p<.05$), but not to communication ($b= .18$, *ns*). However, the three TCC variables were positively related to performance: trust ($b= 1.007$, $p<.001$); commitment ($b= .53$, $p<.01$); and communication ($b= .94$, $p<.001$). Regarding the indirect effects, Hypothesis 2a is supported; the indirect effect shows that trust mediates the relationship between the TEM intervention and performance (ab product term = .27; BOOT S.E. = .08; 95% CI [.011 — .31]) because the CI did not include zero (Hayes, 2017). To further analyse the effect size of the mediation effect of trust, we computed the completely standardized indirect effect based on Preacher and Kelley's approach (2011). The result is .154, which can be considered a medium effect (Kenny, 2018).

Hypothesis 2b is also supported; commitment mediates the relationship between the TEM intervention and performance (ab product term= .21; BOOT S.E. = .12; 95% CI [.016 — .49]).

The completely standardized indirect effect is .124, which can also be considered a medium effect (Kenny, 2018).

In the case of communication, the indirect effect was not significant (ab product term= .17; BOOT S.E. =.14; 95% CI [-.060 — .55]), and so Hypothesis 2c is not supported. In other words, communication does not mediate the relation between TEM and performance.

Discussion

This research aimed to analyse whether a TEM intervention can enhance performance through the collaboration capability in virtual teams with faultlines. Our results show that an intervention for managing emotions in virtual teams with faultlines has a positive effect on performance through its influence on TCC, particularly highlighting the role of trust and commitment as mediating variables.

Specifically, our results did not support Hypothesis 1, which analysed the positive direct effect of TEM intervention on performance. Contrary to our results, past literature highlighted the positive relationship between emotion management and performance (Grandey & Melloy, 2017; Jordan & Troth, 2004, Michinov & Michinov, 2020), and suggested an emotion management intervention as a means to improve performance in face-to-face teams (Turner & Lloyd-Walker, 2008). These results could be explained by the presence of mediating mechanisms not initially considered in previous research, especially considering the lack of emotional management training studies in virtual teams. Hence, our results show that the TEM intervention had a positive indirect effect on performance through trust and commitment, partially supporting Hypothesis 2. These results may be explained by the computer-mediated communication context. Virtual teams are embedded in a complex and uncertain environment (Gilson et al., 2015) where the management of emotions does not directly increase performance, but it facilitates the development of personal links among team members through collaboration capabilities. Moreover, our results support the positive

implications of TCC for team outcomes in virtual teams (Batarseh et al., 2017, 2018): its three components are related to performance, even in teams with faultlines. Considering the relational framework for collaboration (Blomqvist & Levy, 2006), virtual teams with TCC will be able to handle interactions and build shared meanings in a way that increases their results. However, the TEM intervention did not improve communication. For virtual teams, communication may be a collaboration capability that mainly has an instrumental function due to the restrictions of the computer-mediated communication context (Altschuller & Benbunan-Fich, 2010). Virtual team members may not be experts in the use of virtual tools, and the lack of non-verbal cues may be affecting communication so that it has a different function, as some authors suggested in the collaboration framework (e.g. Morgan & Hunt, 1994). Hence, although communication is important in building relationships and performance (Marlow et al., 2018), it could require specific training in how to broaden communication capability functions in virtual teams.

These results make novel contributions to team and computer-mediated communication theory and research. Consistent with previous literature (Johnson et al., 2009; Pitts et al., 2012), our findings further support the importance of emotions and affect management in computer-mediated communication contexts, especially in virtual teams with faultlines. In accordance with SIP theory (Walther, 2015), by training virtual teams, computer-mediated communication can convey emotional information (Derks et al., 2008) that boosts team effectiveness. However, TCC plays a central role (Blomqvist & Levy, 2006) because we were able to improve performance through improvements in collaboration capabilities. We addressed the suggestion of continuing to analyse the influence of TCC in longitudinal designs and different contexts (Batarseh et al., 2017, 2018). Moreover, prior research used experimental approaches to team faultline reduction (Chiu & Staples, 2013; Rico et al., 2012) and pointed out the usefulness of training for deactivating faultlines (van der Kamp et al., 2015). Despite this, to the best of our knowledge, this is the first study to propose a TEM intervention to improve results in virtual teams with faultlines and test its effectivity in an

experimental design. Whereas training is widely used to improve teamwork (Lacerenza et al., 2018), emotion management interventions have largely been neglected (Druskat & Wolff, 2001), and so this study provides evidence of the possibilities of TEM interventions. In addition, computer-mediated communication presents additional challenges that make the expression of emotions and regulation of affect even more relevant (Pitts et al., 2012). Previous research has studied emotion-related constructs in virtual teams (Mysirlaki & Paraskeva, 2020), but emotional management at the group level of virtual teams is still an emerging topic.

Moreover, the findings of this study have practical implications due to the generalization of computer-mediated communication and teamwork in global organizations (Mathieu et al., 2019; Pitts et al., 2012), especially due to the disruption caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which represents a tipping point in the concept of work groups and strengthens the implementation of telework. In this context, virtual teams could become permanent because there is a high probability of new lockdowns and quarantines due to the risk of new COVID-19 outbreaks. This increasing use of virtual teams in organizations presents a unique challenge in their management (Gilson et al., 2015). First, not every team member operating now through virtual collaboration tools has enough computer-mediated communication literacy. Also, virtual teams bring together team members from different locations and cultural backgrounds; and companies need to enhance the benefits of this diversity. Thus, this study provides suggestions about how to manage short-term project teams with subgroups working through computer-mediated communication. First, companies concerned with virtual teams' performance should train them in emotion management. TEM interventions provide team members with emotional strategies and resources that help them to express themselves, interact online, and understand their virtual colleagues, so that they can accomplish goals together even though they may never meet face-to-face. This intervention could facilitate the development of an emotional "safe environment" that fosters their relational capabilities, trust in the other members, and

commitment to them. Moreover, our findings also have implications for computer-supported collaborative learning. Because these teams work with computer-mediated communication tools (e.g. Skype, Zoom, Blackboard Collaborate), the training can also be provided through this medium. We show that online training is a valid approach to improve virtual teams' competencies and performance. Finally, our results also highlight the importance of collaborative capabilities oriented towards building relationships among the members. Thus, organizations that use virtual teams should find ways to promote trust and commitment among team members working through computer-mediated communication contexts.

Limitations and Future Research

Despite its theoretical and practical implications, this study has some limitations. First and foremost, we used an experimental design with a sample of students to create project virtual teams. The use of an experimental design is considered a valid approach to real settings that increases the internal validity of the results; however, it has limitations in terms of external validity. Therefore, future studies should test our model in long-term field teams, aiming to replicate our results in real contexts with teams that have a shared trajectory and member stability, which could increase the benefits of a TEM intervention.

Second, our results are drawn from a rather small sample due to the experimental design with three different time points (Hahn & Lee, 2017), which could also influence the non-significant findings related to Hypothesis 1. However, our research addresses the temporal rationale required to test mediation, avoiding the problems associated with the use of cross-sectional data in communication and psychology research (Cole & Maxwell, 2003). In addition, the use of self-report data could induce common method bias, although the longitudinal design helps to reduce this bias. In any case, our results should be tested in bigger samples and using multiple sources of information (e.g. recording interactions or objective performance) to manage these potential issues.

Third, faultline creation and activation has been carried out following previous experimental studies (e.g. Chiu & Staples, 2013; Rico et al., 2012). However, the appearance of symmetric subgroups due to faultlines is rare in real settings. Thus, future research should design faultlines based on attributes such as hierarchy in an organization, authority, or salary, with asymmetric subgroups (e.g. department heads vs subordinates). Fourth, the use of a direct-consensus model (Chan, 1998) when aggregating the trust scale, while using a referent-shift consensus model for the commitment and communication scales, could limit the generalizability of these findings in relation to the TCC framework (Blomqvist & Levy, 2006). However, we should note that we found high within-group agreement, which allowed us to aggregate and compare data at the team level (Chan, 1998). In any case, future research should measure trust at the group level using referent-shift formulations in the items to overcome this limitation. Finally, we used one type of computer-mediated communication medium to conduct the research (text-based chat), but virtual teams in organizations have a broad array of computer-mediated communication tools (Altschuller & Benbunan-Fich, 2010). Thus, future studies should include other computer-mediated communication possibilities, such as videoconferencing.

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Availability of Data and Material

The anonymized datasets generated during and/ or analysed during the current study are available from the corresponding author on reasonable request.

Ethical Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

ESTUDIO 4: Sustainable Virtual Teams: Promoting Well-Being through Affect Management Training and Openness to Experience Configurations

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Sustainable Virtual Teams: Promoting Well-Being through Affect Management Training and Openness to Experience Configurations

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Abstract: A disruptive digitalization recently occurred that led to the fast adoption of virtual teams. However, membership diversity and team virtuality threaten members' well-being, especially if faultlines appear (i.e., subgroups). Considering the job demands–resources model and the role of group affect in shaping members' perceptions of well-being, we test the effectiveness of a short-term affect management training for increasing members' eudaimonic well-being. Moreover, based on the trait activation theory and the contingent configuration approach, we draw on the personality composition literature to test how different openness to experience configurations of team level and diversity together moderate the effect of the training. Hypotheses were tested using a pre–post design in an online randomized controlled trial in an educational context in Spain, with a sample of 52 virtual teams with faultlines. Results show that affect management training increased eudaimonic well-being. Furthermore, there was a moderation effect (three-way interaction) of openness to experience configurations, so that the training was more effective in teams with high levels and low diversity in openness to experience. We discuss implications for training, well-being, and personality composition literature. This study helps organizations develop sustainable virtual teams with engaged members through affect management training and selection processes based on the openness to experience trait.

Keywords: sustainable virtual teams; eudaimonic well-being; affect management training; faultlines; personality composition; team configurations; openness to experience

1. Introduction

Sustainable and competitive organizations need to pay attention not only to financial results but also to the social dimensions within the organization [1–3]. Among these dimensions, well-being is an essential result in organizational teams because it has been related to team effectiveness [4]. Many of these teams have now become virtual and moved to telecommuting or virtual teamwork, making it possible for employees to work without temporal or geographical boundaries [5,6]. The virtualization of organizational teams took place, initially, because of the broad generalization of information and communication technologies [5,7,8] and, more recently, due to the disruptive digitalization caused by the COVID-19 pandemic [8,9]. In this regard, virtual teams are defined as groups of geographically dispersed members who interact through computer-mediated communication to pursue common goals [10,11] regardless of physical distance, time zones, or other barriers [6]. To be sustainable, virtual teams need to experience well-being, which leads to team effectiveness. However, scholars continually try to identify new ways to improve the sustainability of team members operating in virtual environments [12]. Their dispersion leads to high diversity [11,12] in terms of personality, demographics, or educational background, among others. Diversity may have positive effects on team results [12–15]. Nevertheless, due to the reduced richness of the information exchange and interpersonal contact [10], diversity can also have also negative consequences [16]. Individuals may look for other members within the virtual team with whom they share characteristics, thus leading to team fragmentation. In these circumstances, diversity may be a hindrance due to the emergence of faultlines [17,18], that is, hypothetical lines splitting a team into relatively homogeneous subgroups because of the alignment of two or more individual characteristics [19,20]. Ample prior research has shown the negative effects of faultlines on team results (e.g., [17,18,20–23]). The appearance of subgroups accentuates inter-member negative differentiation between members perceived as the in-group and those perceived as the out-group [24]. Combined with the fast-paced generalization of virtual teams

in educational [25] and organizational environments [26,27], this adverse context could seriously harm team members' well-being [25–28].

In this setting, the job demands–resources model [29] provides a useful framework for studying virtual teams' sustainability [16]. Moreover, this model has been used to study well-being in educational environments [30] and the implementation of innovative teaching methods (e.g., instructional technological tools) [31,32]. Virtualization of work processes could increase technology-induced demands [33], at least in the short term, as well as emotional demands [16], leading to negative outcomes [34]. In fact, technology has mainly been studied in terms of its role as a barrier, rather than an asset, in telework and virtual teamwork literature [5]. In parallel, if members lack the proper skills and knowledge resources, the motivational process is hampered [34,35]. These demands–resources imbalance reduces team members' energy and motivation and increases their cognitive effort, producing exhaustion and disengagement [16,34]. In brief, working in virtual teams with faultlines could reduce their eudaimonic well-being. Following previous research [3,4], we focus on team work engagement as a proxy for eudaimonic well-being. Team work engagement (TWE) is defined as a "shared, positive, fulfilling, motivational emergent state of work-related well-being" [36] (p. 5) characterized by team vigor, dedication, and absorption [37]. TWE is fundamental in virtual teams because it motivates team members to achieve common goals, despite the adverse conditions of the environment. Teams with TWE invest time in thoroughly establishing their goals and steps, creating a coordinated plan that drives them through the sequence to achieve the shared objective [38].

Along these lines, some studies have acknowledged the importance of engagement in virtual teams' outcomes, such as the transfer of tacit knowledge, opportunities for employee development, and performance results in workers and students, among oth- ers [12,16,36,39,40]. Despite this, the literature is still scarce, and surprisingly few efforts have been made to identify ways to promote TWE in the virtual context. In fact, Gilson and

colleagues [41] called for more research on engagement in virtual teams and subgroups because working virtually implies unique challenges for team members. In this regard, we propose affect management as a driver of TWE in teams [38]. Affect management involves the use of emotion regulation techniques and strategies (resources) that create shared positive affective experiences within a group [42,43]. In turn, these positive experiences facilitate the involvement and engagement of team members [16,44,45].

However, affect is difficult to show and manage in computer-mediated communication settings [46,47], and there could be a lack of appropriate skills within this context [34]. Different strategies can be used to improve the interactions and well-being of students and workers in virtual environments, for example, management of leadership [6,8,15], i-deals [2], or experiential classes and training [12,34,48]. In the context of virtual settings, training is a particularly useful way to provide skills that improve the resources–demands imbalance [34]. Training can help to develop engagement in the short time span of a virtual team's lifecycle [49]. Therefore, the first goal of this study is to test the efficacy of affect management training in increasing TWE in virtual teams with subgroups.

Beyond studying the direct effects of affect management training, we also address the role of personality composition. Teams' personality composition could affect team processes, norms, and climate [50]. We particularly focus on openness to experience as one of the big five factors that could help to manage interaction processes related to the resources–demand imbalance in virtual settings [51]. Moreover, the way openness to experience is configured is of special relevance in teams with subgroups [52]. Openness to experience configuration(s) (OEC) is a deep-level composition variable [53] that encompasses the way individual openness to experience aggregates within a given team, combining level and diversity. In this study, a contingent configuration approach [54] is used. Thus, we argue that openness to experience will manifest and influence team results in a complex structure based on the role of job demands and resources. Supporting this idea, the trait activation theory [55] argues

that when working in teams, situational features and social cues act as contingent factors that influence the display of personality traits, as in the case of openness to experience.

Prior research has considered a similar framework when studying engagement and personality [56]. Despite this, there has been debate about the way personality configurations influence team outcomes [57,58]. In this context, personality configurations have been studied through different operationalizations. For example, mean values of individual scores (i.e., team magnitude or level [59]) have been linked to team performance and results ([52,60]. However, other studies have also examined personality in terms of SD values (i.e., diversity), linking it to team outcomes such as performance or interaction styles [61]. Thus, the myriad of results [58,62,63] may be due to the different measurement approaches to personality composition and the complexity of considering various types of configurations existing in a team [58], so that specific compositional effects may not be properly understood [64,65]. The inconsistent results found to date are worrisome because they imply a lack of proper understanding of composition effects in virtual teams, which may lead to inadequate selection procedures and problems for virtual team' sustainability, especially if these teams have faultlines. Thus, there is a need for research that creates knowledge consensus [66] about how different personality configurations influence team results, particularly in virtual teams, where it is still an emerging topic [67]. Consequently, based on the contingent configuration approach [54], we propose that for a team to success- fully increase its TWE through affect management, it must have high levels of openness to experience but also low diversity in this trait. In other words, OEC will moderate the effects of the training on TWE by combining team-level openness and diversity in a complex configuration. In doing so, to the best of our knowledge, this study is the first to combine OEC to evaluate their interactive effects on affect management training.

In the present study, we conduct an online study with control and experimental conditions using a pre–post design with virtual teams in a higher education context.

Students and workers need to develop skills for working in virtual and cross-cultural teams [12,26,34]. Thus, our aim is to test the effectiveness of affect management training in increasing team members' TWE. Moreover, we study the moderating role of OEC, in terms of team level and diversity, in virtual teams with faultlines.

1.1. Affect Management Training and Eudaimonic Well-Being

Well-being is a complex construct with two broad perspectives that shape it [68]: the hedonic and eudaimonic well-being perspectives [69]. The hedonic approach defines well-being as avoiding pain and pursuing pleasure, whereas the eudaimonic approach focuses on a search for meaning and self-realization beyond the pain–pleasure equation. Thus, it represents the extent to which a person is fully functioning [70]. As prior research noted, at the group level, eudaimonic well-being is still an avenue for future research [4,45], particularly regarding engagement [16,41].

To understand how TWE develops in virtual teams of students, we build on the job demands–resources theory [29]. This theory posits that there are two parallel processes that run independently and can affect the perception of TWE: the health impairment process, which arises from job demands, and the motivational process, which stems from job resources [71]. On the one hand, job demands involve costs (e.g., cognitive or emotional demands) because they require sustained effort from the worker. On the other hand, job resources are those characteristics that help reduce demands and achieve team goals [29]. We contend that there is an increase in demands in virtual teams with subgroups. The diminished media richness [10,16], the short-term duration of these teams [10,49] that may have been created without the proper skills [34], and the missing non-verbal communication cues may increase the cognitive effort required in virtual teams [72]. In addition, we argue that subgroups also increase the emotional demands. Geographical dispersion and reduced communication due to computer-mediated communication may contribute to an "out of sight,

out of mind" attitude toward other members [17], making cultural, educational, or personal diversity more salient. Thus, mutual characteristics and differences from other members are highlighted. If two or more characteristics align, social categorization processes lead to faultlines. Social categorization triggers favoritism within the subgroup and negative attributions toward the other subgroup, producing negative interactions and outcomes (e.g., lowered cooperation) [14]. Consequently, negative effects may arise [22,23], and members can feel emotionally charged [47] and experience high levels of social distance and isolation [73], which negatively affects their TWE [16] because these teams are more susceptible to losing group motivation [16,74]. To address this situation, we propose an affect management training that increases participants' personal resources in order to reduce the resources–demands mismatch and increase their TWE. We propose that there is a demands–resources imbalance in this setting because virtual teamwork, unlike working in face-to-face teams, requires the development of specialized competencies through specific training [34]. In this vein, group affect is a structural part of team dynamics [45]. Group affect is created and maintained as a shared experience among team members [43,45] that forms a collective perception from the individual experiences [75]. Recently, emphasis has been placed on the role of collective affect in shaping the way teams interact and the outcomes they produce (e.g., their well-being) [43,45,74]. In addition, negative affective experiences reduce team results because they distract team members from the task itself and their efforts to complete it [45].

In this regard, virtual teamwork is characterized by a low-information environment with limited communication frequency and quality and a greater focus on the task than on the relationships [21,47]. Therefore, our training will provide virtual team members with resources and strategies that allow them to manage the group affect [42]. It will also help to produce de-categorization within the team to reduce the negative effects of subgroups. Affect management training involves techniques such as calming members down, controlling frustration levels, improving team morale, and correctly using online

communication resources (e.g., managing the influence of non-verbal online cues with other members, [47]). Moreover, strategies to leverage affective team climate are also taught, such as joking to soften negative affect, revaluating negative situations, or acknowledging members' contributions [42]. These affective expression and regulation techniques are usually spontaneously displayed in face-to-face communication [76]. In contrast, computer-mediated communication requires purposeful actions to share affective experiences [47]. We stream the training program through an online text-based environment because, despite the technological developments, text-based communication is still the prevalent computer-mediated communication [33,47,77]. Although initial theories considered text-based communication to be a poor medium for the transmission and regulation of affect [46,78], we propose that text-based communication can be used to convey affective information that is correctly perceived and create shared positive affect, even if subgroups are present. In this regard, prior research proposed a reciprocal relationship between affect and TWE [38,44], with training being a potential tool for this purpose [38]. The correct provision and use of resources and strategies (e.g., use of capital letters or emoticons, situation re-evaluation, [42,47,79]) compensate for the increased demands. Then, through emotional contagion among team members [47,80], affective experiences are mirrored by other team members, thus helping to increase TWE. Taking into account the previous arguments and findings, we propose the following hypothesis:

***Hypothesis 1 (H1)**. Affect management training will positively affect TWE in virtual teams with subgroups.*

1.2. The Moderating Role of OEC

The role of personality is essential once team interaction unfolds [81], and team tasks require intense collaboration [82], as in the case of short-term virtual teams. Personality traits

can shape interaction processes linked to well-being within the team, especially in self-managed teams where the lack of formal structures allows interactions to evolve and shows the role of personality in members' perceptions [83]. Additionally, personality has been labeled as a closer antecedent of affective orientations and a more powerful predictor of team results than demographic characteristics [54]. In spite of this, personality composition has hardly been studied in the context of virtual teams [67]. However, there are personality configurations and traits that help teams perform better within a virtual environment [81]. Thus, we focus on a particular trait of the big five factor model [84], openness to experience. Whereas some traits are fundamental in face-to-face teams, openness to experience is important in settings with diminished media richness, such as work in virtual teams [63], or when subgroups exist [52]. The results on openness to experience and team well-being are mixed [52], particularly considering sample and situational characteristics, and there has been a call for more research in this line [63]. In this regard, the many operationalizations (e.g., [60,61,85–87]) and conceptual frameworks, and the influence of contextual factors [63,88] contribute to criticism of personality composition research and variations in the findings [54,58,63]. Initial research proposed isomorphic aggregation, where group personality traits consist of a symmetric combination of individual personality traits (team level). Further models viewed group personality as a complex combination of individual attributes [89,90] in which the way the trait coalesces is studied, and so heterogeneity (i.e., dispersion or diversity) of personality starts to be considered relevant [54]. Consequently, we simultaneously address openness to experience operationalizations (team level and diversity) and test how they moderate the effects of affect management training on TWE, in an effort to disentangle how different patterns of this trait can be applied to improve team results in virtual teams with faultlines.

For this purpose, we use a contingent configuration approach to study the role of OEC in virtual teams of higher education students. As Moynihan and Peterson [54] state, when studying personality in teams, it is necessary to integrate contingent and configuration

views in order to embrace the complexity of personality in teams. The contingent view allows us to analyze the specific circumstances in which some personality traits will be more effective for team results, considering that each personality trait has its own characteristics and particular effects on team well-being. The latter helps us understand the internal dynamics of the team beyond classic personality level studies. Therefore, we focus on a trait that will influence team results through a complex combination of team level and diversity.

Specifically, the contingent approach emphasizes the level of certain personality traits interacting with situational characteristics [54]. We adopt this approach and build on the trait activation theory [55] and previous evidence to consider that openness to experience influences team outcomes in different ways depending on the situational demands [55,56]. Specifically in teams, social cues may act as personality activators. Thus, we propose that the affect management training activities (socially established behaviors agreed on by the team about how to transmit affect online) may act as trait-relevant situational cues that facilitate the display of personality traits [55]. Consequently, although the virtuality of the team and the presence of subgroups may negatively influence openness to experience, this trait could easily be manifested and improve the effects of the training due to the safe environment it generates. Therefore, we propose that openness to experience at the team level, built on the mean values of the individual trait, can appear and benefit TWE by making members more willing to acquire the competencies of the affect management training.

Open individuals are characterized by intellectual curiosity, willingness to experiment, tolerance to ambiguity, a preference for novelty, imagination, and creativity [84,91]. Thus, their willingness to explore and appreciate new environments and experiences [84] makes this trait essential in a virtual teamwork environment. It may have a moderating role because open team members in virtual contexts will quickly learn and use computer-mediated communication resources and strategies [51], and they usually do well in training and

learning environments [65]. Open team members could perceive demands as challenges that allow them to learn and expand their resources, thus promoting engagement [30]. In teams, the level of this trait has been proposed as a facilitator of cognitive resources [87] and may also enhance the effects of affective resources. Teams with high team levels of this trait will be more willing to try new ways of working [50] and engage in flexible innovative behaviors based on new information [92], thus being more favorable to applying resources and strategies to manage group affect. In addition, team-level openness to experience will improve the effects of the training in spite of subgroups because this trait is closely linked to the essence of working in a diverse environment [52,93]. Less open individuals prefer the status quo and are not comfortable with change [94]. Thus, if a team has low team-level openness, its members may prefer working with the subgroup with which they already identify, rather than focusing on the resources and strategies provided by affect management. Supporting this idea, Homan and colleagues [52] found, among other results, that high team-level openness to experience was positive for teams with faultlines. Therefore, the negative inter-subgroup biases that arise in teams with subgroups may depend on members' openness to experience [52]. Consequently, the higher the level of openness within the team, the more likely its members will be to "bridge" faultlines because they will consider the different attitudes, viewpoints, and ideas of other members [52,95].

In addition to the team level, personality diversity, that is, the variability in the individual scores of group members, has been studied as a group-level construct and examined as a predictor of relevant group-level outcomes [89,96,97]. Especially in the context of tasks with frequent interactions, diversity in team-level personality traits helps to predict team outcomes [63]. We operationalize openness to experience composition in terms of diversity through standard deviation [57]. This has been shown to be an effective way to measure diversity when examining interaction effects, especially considered together with the team level [98], and it is an adequate option for this particular trait [87]. This openness to experience diversity refers to the extent to which members are homogenous in the trait of

openness to experience [56]. This operationalization helps to discover the impact of unique configurations compared to the personality level alone [59]. In sum, we depart from previous studies that emphasized the role of the team level to propose an interactive effect between the OEC team level and diversity. Hence, we are considering various aggregation approaches to personality composition that allow us to properly understand its role and impact on team results [99].

As in the case of team-level openness, results on whether high or low diversity in openness to experience will benefit team outcomes are mixed (e.g., [65,87,100]). For example, Hoch and Dulebohn [67] propose that high diversity in openness to experience may be better for virtual team effectiveness because teams with low diversity levels will experience distractions and, consequently, lower performance. If we consider the role of diversity in well-being, low diversity on student teams is related to both satisfaction and team results [100]. Meta-analytic results found that openness to experience diversity was not related to team performance in student teams, but it was negatively related to team performance in professional teams. However, a lack of clear findings about openness to experience diversity was also highlighted, as well as sample limitations [62].

We argue that although studying the role of diversity is important in analyzing the way team members engage in teamwork [90], it is necessary to study it in combination with other composition measures. Consequently, in addition to a high team level, teams with low diversity in openness to experience will benefit more from the training than teams with high diversity. Open team members will be more responsive to environmental challenges. Consequently, they will be more prone to participating in globally distributed ways of working, such as virtual teams [67]. Therefore, if there is a high team level of openness and low diversity, more team members will be willing to work in virtual team settings. Moreover, because we study teams with subgroups, high diversity in openness among

members may deepen inter-subgroup biases created by the presence of faultlines. Thus, low diversity is better for improving TWE via training.

In this study, we propose a best pattern of OEC (high team level and low diversity) to influence team results. As Stipelman [63] stated, studies on the effects of openness diversity (vs. level) on team results have not provided evidence of a compelling effect. Team-related well-being will be present when the members perceive that they fit the team [101] in terms of personality, which helps their motivation and team affective results [54]. Therefore, we argue that the training improves TWE because members are able to manage affect in a "new" virtual environment and overcome subgroups by focusing on the whole team. This effect will be greater if members have an adequate team level of openness that is homogeneous within the team. Thus, we propose that there is an optimum configuration that will improve team outcomes, where higher levels of team-level openness will increase the effects of the training only when the team is also homogeneous in this trait (low diversity). Considering the previous theoretical rationale and empirical findings, we hypothesize the following:

Hypothesis 2 (H2). *OEC will moderate the effect of affect management training on TWE, so that the effect is positive and stronger when there is high team-level openness and low diversity*.

2. Materials and Methods

2.1. Sample

The sample consisted of 52 virtual teams with four members each. The 208 participants in the study were undergraduate students from Work, Organizational, and Personnel Psychology courses in public Spanish universities. Participants voluntarily joined the study and received course credit for doing so. All the teams had the same participants during the entire study. Regarding their demographic characteristics, the mean

age was 20.9 (SD = 5.31), and 69.2% of the sample were women (N = 144). This study was part of a larger investigation about virtual team intervention and effectiveness. The University Ethics Committee approved the project, and confidentiality of individual responses was guaranteed. All participants were asked for informed consent for their participation and the use of the data for research purposes.

2.2. Design and Procedure

We carried out a randomized controlled trial with a pre–post design. This study included a between-subjects factor (training) and a within-subjects factor (time of measurement: pre–post intervention). The entire study took place through an online web-tool specifically designed for dispersed synchronous interaction among team members. This web-tool had a text chat with emoticons and a panel to broadcast video, instructions, and training, either individually or in groups. It also allowed participants to interact during the activities by answering the training exercises or doing the experimental tasks together.

Procedure. We graphically depict the design and procedure in Figure 1. As the figure shows, participants first attended an informative face-to-face meeting in which they received information about the use of the online web-tool and rules. They also completed an initial questionnaire with demographic questions and the Openness to Experience scale, among others. Then, groups were formed and randomly allocated to the training condition or the waitlist control condition. After that, the study took place for a period of approximately four weeks. On a weekly basis, teams in the training condition engaged in the pre-training experimental session, received the affect management training, and participated in the post-training experimental session. Teams in the control condition first participated in the two teamwork sessions and then received the training.

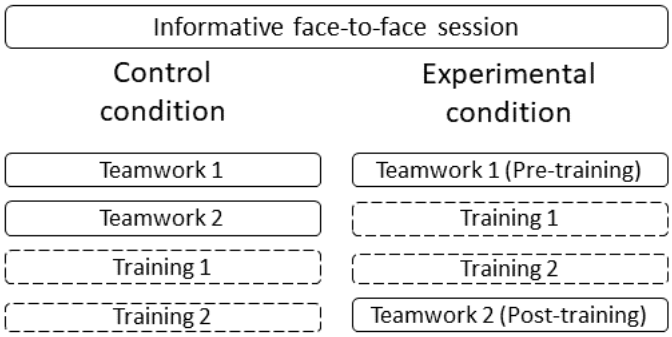

Figure 1. Scheme of the research design of this study.

Group formation. Each virtual team was composed of two dyads that formed each of the subgroups. These dyads had specific aligned diversity characteristics in order to elicit subgroup perceptions within each team. First, the university of origin was used, with each dyad within a team being from a different university in Spain. Moreover, on the initial questionnaire, we asked participants for their favorite leisure activities from a checklist. Then, as in prior research [102], we created two bogus adventure profiles (bold vs. thoughtful). Then, we randomly formed the dyads based on the same adventure profile and university, and we created virtual teams with two opposing dyads to create the faultline.

Following previous faultline studies (e.g., [22,103]), we also performed specific experimental manipulations to elicit subgroup perceptions. First, the official colors and heraldry of each university were present during the interaction in the virtual web-tool. In the pre-training session, participants were explicitly told about their profiles and the different profiles of the other two members. This was also reinforced by a zero-sum game in which they allocated resources to their two universities without being allowed to split the budget in half.

Experimental task. In the pre- and post-training sessions, each team performed an intellective decision-making task. Specifically, they engaged in two different “survival” tasks

[104] integrated through digital storytelling. These tasks put participants in a hypothetical dangerous situation, and they had to put a list of pre-defined objects in order depending on their relevance for surviving the imminent risk. Virtual team experimental studies have commonly used these sorts of tasks (e.g., [18,105])**.** In the pre-training session, they first organized the objects in pairs to strengthen the perception of subgroups, and then they had to agree on a common order as a team.

Affect management training. The affect management training consisted of two sessions. The first training session focused on emotion identification, expression, and regulation in virtual teams. Participants were taught the importance of affective experiences online, the use of shared codes, and the techniques to express and understand emotions in virtual contexts (paralinguistic cues, chronemics, and emoticons [106,107]). The second session was designed to work on the affective climate while interacting online as a team. We taught them how to foster a positive affective climate using strategies (e.g., sending motivational messages to achieve common goals) for computer-mediated communication. In each training session, first, an individual section was held. This individual part lasted about 25 min and consisted of theoretical explanations and individual practical activities. Once all the participants had completed the individual section, the group section presented similar exercises related to the contents of the session, but now all the members had to agree on the answers, generating a shared understanding of how to manage affect in the virtual environment. For example, they were presented with a strategy, and they had to write two possible group work situations where they considered it useful to apply this strategy to maintain a positive group work climate (or avoid a bad emotional climate).

2.3. Measures

Openness to Experience Configurations: Openness to experience was measured with ten items on the Big Five Inventory that measure this trait. We used the validated Spanish

version by Benet-Martínez and John [108]. The items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Examples of the items are “I see myself as someone who is curious about many different things” and “I see myself as someone who is original, comes up with new ideas”. Cronbach’s α for this variable was 0.76. As noted above, we used the two most common operationalizations of team level and diversity, the aggregated mean values of the individual scores and the mean values of standard deviations of openness to experience within each team.

Team Work Engagement: We measured this construct with an adapted version of the Team Work Engagement Scale (TWES-9; [38]), which is composed of nine items. The items were scored on a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The primary scale of the TWES-9 contains three dimensions: vigor, dedication, and absorption. These dimensions are part of the original individual-level construct. Despite this, previous studies [38,109] propose that a one-dimensional structure fits engagement better at the group level.

Thus, this study uses TWE as an emergent shared state of work-related well-being. Examples of items are: “When we are working together, we feel bursting with energy” or “We are enthusiastic about this task”. We used this variable at the pre- and post-training sessions. Cronbach’s α values for this variable were 0.93 and 0.96. Moreover, this variable was measured at the individual level but aggregated to create a team-level construct based on a referent-shift consensus model [96]. To ascertain that the aggregation can be carried out, ICC(1) (intraclass correlation coefficient) and $R_{WG(J)}$ were calculated in both experimental sessions [110]. ICC(1) for pre-training was 0.10 and for post-training 0.15. Regarding $R_{WG(J)}$, the values were 0.091 (SD = 0.16) for pre-training and 0.86 (SD = 0.29) for post-training. All these values are above the classic cut-off points for these indexes [110], thus supporting our chosen approach to aggregate survey data at the team level.

Control variable: Team familiarity: Given our research context (teams with subgroups interacting online in a randomized experimental design), we specifically aimed to omit the influence of being acquainted with other team members so that it would not be a confounding variable in the studied relationships. Prior research has shown that familiarity may influence virtual team results [111], specifically when the team collaborates online to establish group norms [112], as in the case of our training. In this study, team familiarity was measured as previously knowing other team members [113,114]. As in prior research (e.g., [113]), in the pre-training session, we asked participants, "To what extent did you know each of your teammates before the experiment?" They rated their familiarity with each of the other three team members on a scale from 1 (not at all) to 5 (a lot). A higher mean rating on this scale would indicate high familiarity among team members. Thus, we controlled this variable in order to isolate the effects of the study variables and manipulations conducted, which could be affected by prior knowledge of the teammates, with a particular emphasis on affective experiences and subgroup perceptions.

2.4. Data Analysis

Preliminary analyses included randomization checks and manipulation checks for the affect management training and the identification with the subgroup by means of *t*-tests for independent samples. SPSS V.26 was used to test the hypotheses. To test Hypothesis 1, we conducted a mixed Analysis of Variance (ANOVA) because there was a between-subjects factor and a within-subjects factor. We introduced the intervention condition (training-control group) as the between-subjects variable and TWE mean values at pre- and post-intervention as the within-subjects variable.

We tested the hypothesis 2 using hierarchical ordinary least squares (OLS) regression. Continuous moderating variables were mean-centered. Predictors were entered into the equation in six successive steps. First, we introduced the study control variable and controlled for the stability effect by introducing pre-intervention TWE. In the second and third

steps, we introduced the affect management training (coded as a dummy variable where 0 represents the control group and 1 represents the experimental group) and the moderating variables (OEC team level and diversity), estimating the direct effects of these variables. In the fourth step, the interaction terms between the training and the moderating variables were entered. In the fifth step, we added the interaction term between the two moderating variables. Finally, in the sixth step, the three-way interaction term (affect management training, OEC team level, and diversity) was entered.

3. Results

3.1. Randomization and Manipulation Checks

Randomization was checked to ascertain that there were no initial differences in the TWE levels before the intervention. The results were non-significant ($t(50) = 0.918$, $p = 0.36$). Therefore, teams were adequately randomized across the experimental and control conditions.

Regarding the manipulation checks, for the affect management training, we followed previous studies (e.g., [22,115]) and assessed team members' perceptions of whether they correctly perceived and used the training contents. To do so, ten items on an ad hoc scale were used. The items were rated on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). An example item is, "We used paralanguage signs (e.g., onomatopoeia, capital letters) to qualify our written messages". Reliability analyses show adequate values in the two experimental sessions: pre-training Cronbach's α was 0.81; post-training Cronbach's α was 0.87. Aggregation at the team level was also performed [110] because the rwg(j) and ICC(1) showed a proper fit. Pre-training rwg(j) was 0.85 (SD = 0.11), and post-training rwg(j) was 0.84 (SD = 0.12). Regarding the intraclass correlation, pre-training ICC(1) was 0.22, and post-training ICC(1) was 0.37. The results show that the values in the experimental ($\bar{x} = 2.45$ (SD = 0.55)) and control ($\bar{x} = 2.59$ (SD = 0.56)) conditions

at pre-training did not differ ($t_{(50)}$ = - 1.40; ns). However, after the intervention, there were significant differences ($t_{(50)}$ = 2.33; $p < 0.01$) between the experimental ($\bar{x}$ = 2.84 (SD = 0.47)) and control ($\bar{x}$ = 2.55 (SD = 0.43)) conditions in their use of affect management resources.

Regarding the identification with the bogus characteristics used to elicit subgroup perceptions, similar to prior research (e.g., [22]), we adapted two items from the relative in-group homogeneity scale [116]. Each team member was asked how much he or she identified with the bold profile and the thoughtful profile. The items were rated on a four-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Since these can be considered single-item scales, reliability was not assessed. The results also support further analyses. Team members presented higher identification with their assigned profile than with the opposite profile. In the case of the thoughtful category, the perceived identification with this profile was higher than with the bold profile ($\bar{x}$ = 4.63 (SD = 1.22) >3.33 (SD = 1.41)), and this difference was significant ($t_{(103)}$ = 8.03; $p < 0.001$). Similar results were found for the bold profile ($\bar{x}$ = 4.39 (SD = 1.22) > 3.95 (SD = 1.34)), and this difference was also significant ($t_{(103)}$ = 2.39; $p < 0.05$).

3.2. Preliminary Results

The data describing the characteristics of the sample (descriptive statistics: means and standard deviations) for the main variables used in the analyses are displayed in Table 1. Control variables and manipulation checks are not included.

Table 1. Means and standard deviations for study variables.

Between-Subjects Condition	Control Groups		Training Groups	
Variables	Mean	SD	Mean	SD
1. Pre-intervention TWE	4.85	0.42	4.72	0.54
2. OEC team level	3.6	0.24	3.5	0.22
3. OEC Diversity	0.52	0.23	0.52	0.23
4. Post-intervention TWE	4.8	0.61	5.1	0.53

3.3. Hypothesis Testing

Hypothesis 1 proposed that affect management training would increase TWE levels in comparison with a control group. The results of the ANOVA reveal no global direct effect of the affect management training ($F(1,50) = 3.5$; $p = 0.07$; $\eta p2 = 0.063$), and so comparing TWE at the pre- and post-training levels did not produce differences. However, as expected, the results showed an interaction effect ($F(1,50) = 5.4$; $p < 0.05$; $\eta p2 = 0.098$) of the affect management training depending on the condition. Thus, there were differences in TWE before and after the training depending on whether the participant received the training (experimental condition) or not (control condition), with a medium effect size. As Figure 2 shows, in the pre-training session, mean values of TWE before the intervention were similar in teams in the control condition (M = 4.85, SD =0.42) and teams that received the training (M = 4.7, SD = 0.54). However, after the intervention (post-training), teams that received the training significantly increased their TWE levels (M = 5.1, SD = 0.53), whereas teams in the control condition slightly decreased their TWE (M = 4.81, SD =0.61).

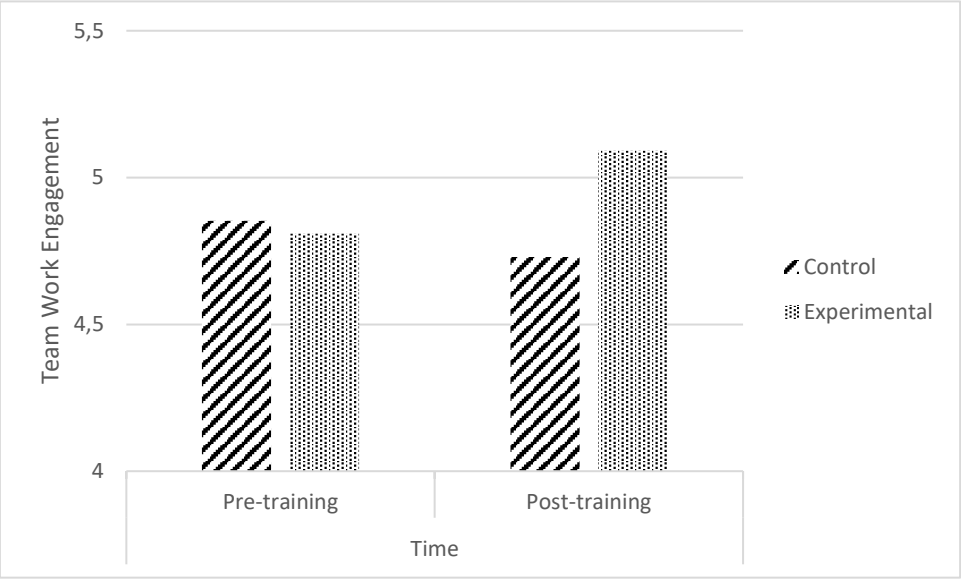

Figure 2. Comparison of the mean values of team work engagement (TWE).

Hypothesis 2 proposed that the best pattern of OEC to moderate the effects of the affect management training would consist of high team level OEC and low diversity.

The results of the OLS regression are shown in Table 2. Supporting Hypothesis 2, the regression coefficient for the three-way interaction term was statistically significant (Step 6, $b = -6.16$, t = −2.25, 95% CI [−11, −0.64], $p < 0.05$). Thus, as expected, there was a three-way interaction in which OEC team level and diversity interacted to influence the relationship between training and TWE. Moreover, this interaction added a significant percentage of explained variance (8%) to the independent explanatory power of the predictors, in addition to the individual moderating effects.

Table 2. Results of regression analyses for team work engagement.

Predictors	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Main Effect						
Engagement T1	0.327 #	0.380 *	0.390 *	0.401 *	0.401 *	0.379 *
Familiarity	0.099	0.185	0.181	0.280	0.255	0.076
AFT		0.345 *	0.348 *	0.360 *	0.353 *	0.280 #
OEC Level			0.011	0.123	0.164	0.396
OEC Diversity			0.201	0.940 #	0.976 #	1.15 *
Two-way interaction						
AFT × OEC level				−0.07	−0.05	−0.53
AFT × OEC Diversity				−1.45 *	−1.42 #	−1.83 *
OEC Level × Diversity					0.587	3.656 #
Three-way interaction						
AFT × OEC Level × Diversity						−6.157 *
R^2	0.072	0.156	0.162	0.236	0.239	0.321
F	1.88	2.96 *	1.78	1.94 #	1.692	2.2 *
ΔR^2	0.072	0.085 *	0.006	0.074	0.003	0.082*

Note. # $p < 0.1$ * $p < 0.05$; two-tailed. AFT = Affect Management Training; the regression coefficients shown are unstandardized.

As Figure 3 shows, we graphically represented the results for the conceptual model of the study. We show the coefficients of the direct (Hypothesis 1) and moderation effects of OEC in terms of team level and diversity (Hypothesis 2).

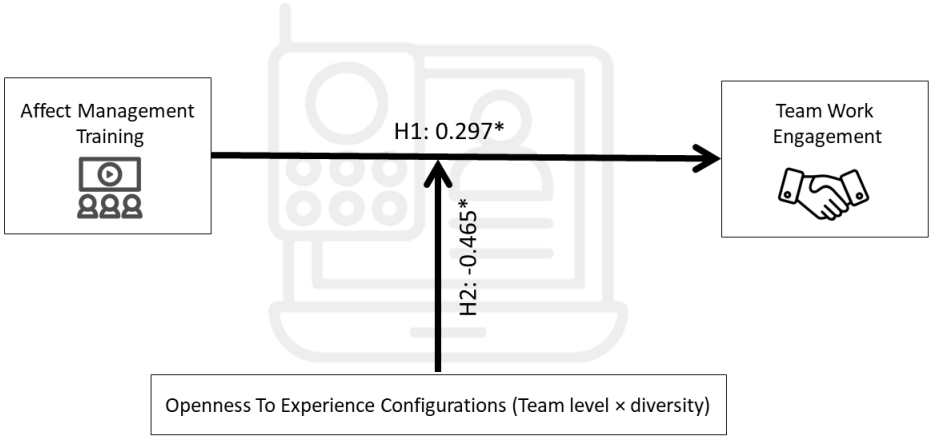

Figure 3. *p< 0.05. Proposed conceptual model with hypotheses and standardized effects results.

Following Aiken and West [117], we interpreted this significant three-way interaction effect using the simple slope test, in order to find out whether the effect of the training on TWE was significant at specific high and low values (1 SD below and above the mean) of the moderating variables. As line 2 of the plot in Figure 4 shows, the effects of the training were positive and significant when there was high openness to experience at the team level and low diversity (t = 3.27, p < 0.01), whereas the rest of the combinations were not significant. Specifically, the configurations of high level of openness to experience and diversity (1) (t = 1.5, p = 0.13) and low levels of openness with either high (3) (t = 1.1, p = 0.267) or low diversity (4) (t = 1.67, p = 0.103) did not produce significant results. Thus, we can conclude that the predicted pattern (high levels of openness to experience and low diversity) is the one that best helps to enhance the effects of the affect management training on TWE.

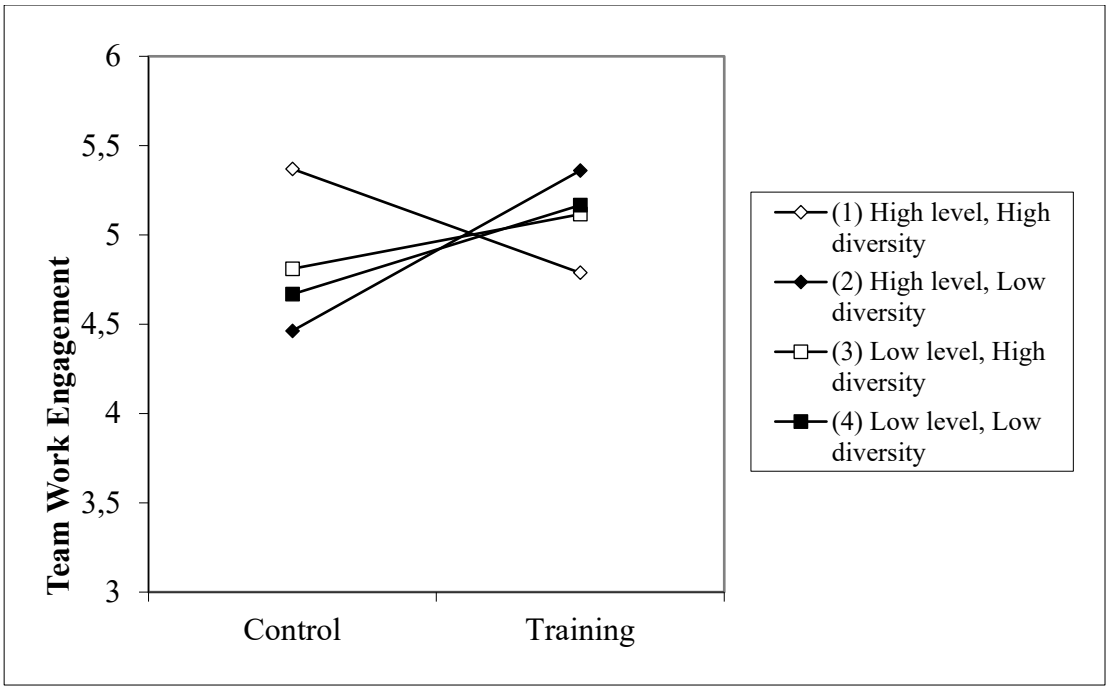

Figure 4. The moderated effect of openness to experience configurations (OEC) (team level and diversity) on the relationship between affect management training and TWE.

4. Discussion

Due to an increasing use of diverse workforces and the digitalization of work, virtual teamwork is inevitably ubiquitous. Thus, there is a need to study factors that promote its sustainability in terms of well-being and effectiveness. In this regard, the current study tested the efficacy of a short-term online affect management training to increase team work engagement (TWE) in students' virtual teams with subgroups. In addition, we examined different configurations of openness to experience (OEC) as moderators of the effects of the intervention. We tested whether there is a type of OEC, in terms of team level and diversity, that may increase the efficacy of the training.

Supporting Hypothesis 1, the results showed that teams that received affect management training increased their use of resources and strategies for sharing, interacting, and managing affective experiences in virtual teamwork, thus enhancing their TWE. We considered that virtual teams need to develop affective competencies because

the process of computer-mediated communication differs from face-to-face interactions [47,74], where communication competences are informally developed. These competencies function as buffering resources in virtual environments, and so specific formal training is an appropriate intervention [34] to promote virtual teams' sustainability. In this way, technology provides opportunities for development and learning, which, if managed properly, can help correct the demands–resources incongruence that may produce disengagement [16,34]. Our intervention focused on the management of group affect in virtual environments. Prior literature highlights the importance of group affective experiences (e.g., [45,118]). Affect at the team level emerges because each member feels a similar level of certain affective experiences [43]. If the group can develop positive group affect, they will show more interest in the given task, attend to its requirements, dedicate time and effort, and feel more engaged [44]. However, in virtual environments, the synergy processes influencing affect may be diminished or even trigger negative affect due to the reduced richness of the environment, interactions, and information exchange [10,47]. The current study offers evidence that online training can provide resources and strategies to manage group affect. Thus, we were able to promote engagement at the group level by means of identifying, expressing, and regulating the expression of their own and other members' emotions through computer-mediated communication. We also highlighted the use of online strategies for fostering a positive affective climate, despite the potential threats and demands of the virtual environment.

Focusing on openness to experience, the results support Hypothesis 2. When applying our training, there is an optimum configuration consisting of a high level of openness to experience and low diversity in this trait among team members. This pattern increased the effects of the training, whereas other configurations did not show significant effects. As expected, the characteristics of open individuals (e.g., quick learners and capable in training environments, skilled in evaluating threats as possibilities, sensitive to new ways of working) facilitate features of the affect management training. This result supports previous research

[119] where openness to experience moderated the relationship between the resources available in the group and engagement. Moreover, teams with high openness at the team level were expected to be more adaptable to the changing environments that often characterize virtual teamwork [67]. However, we go beyond previous research and test the combined effects of the two most common operationalizations: team level and diversity. Moreover, the study contributes to extending the theoretical framework of the trait activation theory [55] and the configuration perspective [54] to the context of virtual teams with subgroups, helping to understand the role played by openness to experience configurations.

These results have important implications for theoretical development and research. We contribute to the literature on virtual teams' well-being, sustainability, and group composition. First, our findings further support the importance of group affect in eudaimonic well-being [4,45], especially in virtual environments [47]. Thus, we respond to the call to study how well-being develops in virtual teams [4], with particular emphasis on the role of TWE as a proxy for eudaimonic well-being [3,4]. Considering the digitalization of work and life [7,120,121], especially since the disruption caused by the COVID-19 health crisis [9], there is a need for sustainable teamwork. Moreover, sustainability in virtual environments is still an unfolding topic (e.g., [121]). Thus, to develop sustainable virtual teams, prior research highlighted the importance of focusing on engagement [16,41,49]. Our research adds value to prior results [49] by using synchronous virtual teams and a longitudinal (pre–post) design, which is a requirement in investigating the dynamic relationships between affect and motivation over time [44].

Second, these findings also yield support for short-term affect management interventions as a way of providing resources for working online, despite the potential detrimental effects of faultlines, thus providing support for the job demands–resources theory [29] in virtual teamwork studies. We built on this theory and previous literature [18,33,41,74] by highlighting how the emotional and technological demands linked to working in a virtual

environment and with subgroups may harm TWE, as well as the importance of providing affective resources to tackle this question. Our study suggests that affect management training will provide team members with a repertoire of strategies and resources that help them attenuate the negative effects of subgroups and virtuality and increase their TWE.

Third, this study adds a significant result to the broad personality composition literature. We help to create consensus in the personality composition literature by exploring which configuration(s) of openness to experience increase the effects of the training program. Thus, this study provides new unique insights into the way different patterns of one specific trait of personality may support the process of creating sustainable virtual teams. Whereas previous studies have considered different composition measures (e.g., team level, variability, best-member score), this study is unique because it combines them to form patterns that influence the effects of training on team well-being.

We specifically contribute to disentangling the black box of openness to experience configurations in virtual teams. We built on a contingent configuration approach [54] and drew on trait-activation theory [55] to propose a specific configuration of OEC (high team level, low diversity) that positively moderated the effects of the training. Our findings support these theories by suggesting that OEC plays an important role in shaping team members' perceptions and behaviors. Our results support the combined effects of both operationalizations, contributing to establishing a contingency framework and helping to advance current efforts to analyze personality composition in teams with faultlines and sustainable virtual environments. In this regard, our study advances the knowledge by investigating multiple configurations that influence the effects of affect management training on TWE. Understanding these moderating processes expands this area of research and leads to its further development, as well as pointing to practical implications for those interested in using short-term affective interventions to increase well-being.

Thus, we combined the team level and diversity of the trait in order to show a more complex picture of the phenomenon. To the best of our knowledge, this study is the first to test different OECs and their moderating role in fully dispersed virtual teams with subgroups with the goal of improving training effectiveness in increasing TWE. We showed that an optimal configuration of OEC exists, depending on the context and the outcome.

4.1. Limitations and Future Research

Despite the important contributions to theory and research, our study has some limitations. First, we conducted a randomized controlled trial with short-term ad hoc fully dispersed virtual teams composed mainly of young students from higher education institutions in Spain. This may limit the generalizability of our results because teams are usually partially dispersed, and virtuality is just one characteristic of their complex structure [122]. In addition, they are created from existing workers in an organization, and so there is a common background among members. Consequently, future research should analyze the effects of the affect management training on different types of virtual teams and extend the organizational context studied.

Moreover, due to the sample, generational differences may be influencing the results. It is possible that young students have developed early competencies for computer-mediated communication and feel more comfortable using it. Therefore, future research should aim to study established work teams with more tenured and older team members, or at least evaluate the impact of generational differences. In addition, regarding the design, and due to logistic constraints, we tested our hypotheses and conducted the intervention in a short period of time, and so we were only able to draw conclusions about the short-term effects of the training. Although our findings make a relevant contribution to theory and research due to the importance of training studies and the prevalence of virtual teams, future research should build on them to examine the long-term effects of affect management training on group well-being. Finally, we used a waitlist control design to test our hypotheses. This design is

adequate [115], particularly if we consider the scarcity of virtual team intervention studies. This design is useful because it allows waitlisted participants to benefit from the intervention. However, to further support the role of training in building sustainable virtual teams, future studies should use active comparison conditions that can increase affect and well-being. For example, affect management training versus cognitive resources training, or interventions based on the use of computer-mediated tools, considering the job demands–resources theory [29], may help increase group well-being.

On a content level, we evaluated eudaimonic well-being as TWE. This is the most common form of eudaimonic well-being, and good quality, longitudinal research is necessary to address the relationship between group affect and team engagement [4]. However, further research needs to explore the role of other eudaimonic constructs at the team level, such as work purpose or collective flourishing, as well as combinations of hedonic and eudaimonic well-being constructs, so that happy sustainable teams can be achieved.

Another resource that can also be studied, as noted in prior research (e.g., [6,8,15,32,123]), is the role played by leaders in virtual teams. Leaders can help set clear team directions and build a supportive team climate [6].

Moreover, this work makes another contribution to the broader picture of personality composition studies in virtual teams and teams with subgroups. However, we only used one personality trait as a moderator. Although we heeded the call to use different group configurations when studying personality composition (e.g., [60]), we only did so for openness to experience. Despite this, other traits from the Big five factors model (e.g., extraversion [53,61]) are also of primary importance when interacting in virtual teams [67]. If we depart from the contingent perspective, the internal fit of multiple traits within groups is also possible and could be an interesting future avenue of research. Finally, recent research also highlights the role of other personality factors besides the Big Five (e.g., dark

triad: Machiavellianism, narcissism, psychopathy) when studying effective teamwork [124]. Thus, future research can focus on multiple personality factors at the same time in order to observe their interactive effects.

4.2. Practical Implications

Our results also have some practical lessons for instructors, professors, HR professionals, and managers. First, eudaimonic well-being is a key factor in teams, educational organizations, and companies operating in turbulent environments [2,12]. However, many teams lack the proper competencies for adequate teamwork [12,125], in terms of the skills required for interaction, performance, and affective outcomes. Consequently, sustainable virtual teamwork is an unresolved matter, especially considering the recent disruptive digitalization, particularly in higher education contexts. In this regard, this study supports the use of short-term online training focused on team members' soft skills (i.e., affect management) to improve their engagement in their work or academic units. Thus, if team members can identify and regulate the affective experiences within the team, they will feel more focused and have more vigor and dedication. Particularly in academic environments, affect management could help to improve students' involvement in their work and, therefore, their academic performance.

Second, the proposed intervention can also help to overcome biases if diversity be- comes problematic, especially considering the diminished information environment [10,47] where virtual teams interact. Teamwork currently requires working with culturally diverse colleagues by means of virtual tools, and so it is necessary to prepare students for this reality [12]. Thus, by extending the evidence about effective ways to overcome the negative impact of faultlines [18,22], our findings provide team managers and professors with a tool for dealing with inter-group negative dynamics. Prior literature pointed out the need to study intervening variables that help identify the effects of affect and subgroups on team results [41], as well as mechanisms that attenuate their negative effects [23]. Through the proper management of

affective experiences (affective computer-mediated communication techniques, resources, and strategies), virtual teams can reduce subgroups' negative effects, increasing their eudaimonic well-being.

Third, the way technology is designed and implemented is a key to whether it will be perceived as a resource or a job demand [34]. Thus, training can help manage the potential job demands stemming from structural conditions. As virtual teams continue to grow [7,25] and the health pandemic forces the rapid generalization of virtual team- work [26], many workers or students may lack the proper skills to cope with technology- related changes [12,34]. Thus, in this context, affect regulation and interventions (e.g., training) become critical [27,34] in creating sustainable virtual teams. In this regard, this study provides support for the usefulness of online training and interaction tools (e.g., ZOOM, Blackboard Collaborate, use of webinars) in increasing team resources to improve group well-being in the short term in virtual teams of students.

Finally, our results for openness to experience provide a stimulus to reflect on the relevance of building teams by considering the personality traits of the members, as well as the way personality is aggregated to form configurations. Thus, when an organization or instructor creates a virtual team project, training helps promote well-being. However, it is important to look for members with high levels of openness to experience, and the selected members must be homogenous in terms of this trait in order to optimize the effects of the training. This is relevant for selection and team formation purposes because our findings suggest that different configurations of this trait can enhance the role of contextual tools such as organizational interventions.

Aside from our stated goals, these practical implications suggest some lessons for higher education contexts that are summarized in Table 3.

Table 3. Practical implications for educational contexts.

Practical Implications of a Short Online Affect Management Training
For students: ✓. . . increases soft skills in virtual environments (identify and express emotions, use affect regulation strategies, management of non-verbal cues in online communication). ✓. . . facilitates proper management of affective experiences (affective computer-mediated communication techniques, resources, and strategies), which may reduce diversity negative effects and increase their well-being.
For instructors: ✓. . . provides a tool for dealing with inter-group negative dynamics and team resources to improve group well-being (engagement) in short-term virtual teams. ✓. . . its effectiveness can be enhanced if teams are composed by "open" students (i.e., those with intellectual curiosity, tolerance to ambiguity, a preference for novelty and creativity).

5. Conclusions

As the literature continues to demonstrate the importance of promoting well-being in teams, little attention has been paid to applying and testing effective interventions that help to overcome the challenges of the virtual environment where organizational teams must interact. Based on this research, online training is an effective means to improve well-being. Thus, organizations aiming to create sustainable virtual teams should consider offering affect management training to their members. Our results also suggest that it is necessary to pay attention to openness to experience configurations, aiming for a pattern with a high team level and low diversity in this trait when applying affect management training programs. We encourage further studies along these lines to better understand how personality composition influences virtual teams. A research effort must be made to find new ways to improve eudaimonic well-being and create sustainable virtual teams.

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SUMMARY

INTRODUCTION

Collaborative virtual environments

Over the last years, there has been a significant and growing application of technology that extends to almost all spheres of our society. The use of the internet has become widespread worldwide and access to information and communication through technology has been a key element for the development and global sustainability of our society (ITU, 2021). This diffusion of technology has crystallized in its use mainly for social interaction and communication (Cascio & Montealegre, 2016). In addition, digitalization and new ways of working are making their ways, especially driven by the impact of COVID-19 (Feitosa & Salas, 2021; van Laar et al., 2017).

The pandemic has promoted changes in the processes of group interaction and virtual collaboration (Klonek et al., 2021). The proliferation of diverse tools and platforms has enabled rapid interaction, creation and exchange of information, generating **collaborative virtual environments** where participants share knowledge and influence each other (Gilson et al., 2021; Peters & Manz, 2007). Therefore, work as we know it has been transformed by the increasing use of virtual collaboration tools in organizations and the emphasis on teams (Mak & Kozlowski, 2019; Mathieu et al., 2017). Thus, there is a growing interest in virtual teams in their various configurations (Dulebohn & Hoch, 2017; Gilson et al., 2021; Larson & DeChurch, 2020). In addition, the use of virtual collaboration has also facilitated the development of larger and more complex team structures, with broad objectives such as multi-team systems (Turner et al., 2020; Zaccaro et al., 2012) or virtual communities (Henri & Pudelko, 2003). Thus, we define these virtual collaboration units -teams or communities- as groups of geographically, culturally and/or temporarily dispersed individuals who communicate and interact through collaborative virtual environments. These groups possess one or more common goals, show interdependencies in relation to their tasks, workflow, interests and/or outcomes. In addition, they share a certain common structure, engage in

interactive activity and maintain a dynamic network of relationships among their members (DeSanctis & Monge, 1999; Jarvenpaa & Leidner, 1998; Martínez-López et al., 2016; Rheingold, 1993; Zornoza et al., 1996). This definition therefore includes what has traditionally been studied as virtual teams, but also encompasses the application of virtual collaborative work tools to broader group configurations, with different levels of interdependence and long-term or more diffuse goals, such as virtual communities (Henri & Pudelko, 2003; Rheingold, 1993). Therefore, the study of virtual collaboration in work groups allows for the analysis of virtual teams or communities, varying these environments according to the structural and social characteristics of each context.

Collaborative virtual environments: advantages and opportunities

Teams and virtual communities are integrated into organizations with the aim of **improving** organizational performance and are an effective tool for the promotion of work, the development of their members, the organizations themselves and society (Ardichvili, 2008; Demerouti, 2020; Dulebohn & Hoch, 2017; Martínez-López et al., 2016; Zhang et al., 2010). Thus, at the organizational level, the use of collaborative virtual environments can drive organizational growth by increasing competitive advantage especially in uncertain and complex environments (Caligiuri et al., 2020; Chai & Park, 2022) and thus have a significant economic impact (Jimenez et al., 2017). For example, it allows organizations to select the best members for their composition regardless of their geographical location, with greater flexibility and eliminating costs associated with their mobility. In addition, it optimizes the flow of tasks by enabling continuous work even across time zones (Dulebohn & Hoch, 2017; Jimenez et al., 2017). These environments also support new sources of information, proper knowledge management and increased organizational learning (Bergiel et al., 2008; Henri & Pudelko, 2003; Jimenez et al., 2017).

In parallel, research has found that the greatest advantages and opportunities can accrue to the group itself and its members. The members of these collaborative environments benefit from the autonomy, flexibility and reduced travel times that working in a virtual team allows (Morrison-Smith & Ruiz, 2020) and can generate a variety of positive individual experiences. Thus, well-managed virtual teams increase the motivation, learning and job satisfaction of their members (Nurmi & Hinds, 2016). Similarly, participation in virtual communities of various kinds promotes personal recognition, self-esteem, learning and well-being, with the main benefit being *barrier-free* socialization -the establishment and maintenance of relationships between members- (Henri & Pudelko, 2003; Martínez-López et al., 2016).

Additionally, a key element in the functioning of collaborative virtual environments is the diversity of the members. This diversity (in social or technical terms) can have a positive impact on the group and its outcomes (Gilson et al., 2015; Jimenez et al., 2017). Thus, people with diverse educational backgrounds and who are in different locations can facilitate not only innovation and creativity, but also adaptability and decision-making (Chamakiotis et al., 2013; Gibbs et al., 2017; Gilson et al., 2015; Jimenez et al., 2017). Thanks to the divergence of members' perspectives, these teams have more and varied cognitive resources, with greater problem-solving capacity, because it allows them to properly assess alternatives and avoid groupthink and conformity phenomena (Jimenez et al., 2017).

All of these advantages have encouraged several big companies to move towards working with teams with some degree of virtuality (Alves et al., 2022; Mak & Kozlowski, 2019). In addition, the frequent and current use of virtual collaboration environments increased significantly with the pandemic (Chai & Park, 2022; Gilson et al., 2021). In fact, more than 75% of workers now consider the use of virtual collaboration environments to be an optimal way of working in the future (Accenture, 2021; RW3 CultureWizard, 2022).

This evidence on its benefits and usage data implies a paradigm shift in the management of virtual collaboration and interpersonal relationships (Gilson et al., 2021; Malinen, 2015; Rolls et al., 2016). Therefore, recent research seeks to study the mechanisms of effectiveness of these virtual environments through different configurations and variables (*e.g.* (Alsharo et al., 2017; DeChurch & Mesmer-Magnus, 2010; Hernández Soto et al., 2021)). However, this study is complex since current models of group effectiveness point to the combined and interactive role of group characteristics and processes in the outcomes and affective reactions of the group (Mathieu et al., 2019). Similarly, the mutual influence between affective and effectiveness outcomes has been suggested (happy and productive groups/teams thesis, García-Buades et al., 2020; Peñalver et al., 2019). Therefore, understanding and improving the functioning of collaborative virtual environments requires a combined study of the inputs (structural features, resources), the processes involved; and the objective and subjective outcomes. However, a significant part of the literature on virtual groups has focused on effectiveness outcomes, while well-being has not been sufficiently integrated into virtual team research (Gilson et al., 2015) and recent literature calls for a continued understanding of it in a variety of domains (García-Buades et al., 2020; Peiró et al., 2021).

Challenges of collaborative virtual environments

Considering the previously stated ideas, there is a need to design and implement intervention strategies and programs to improve effectiveness and well-being. Scientific literature has shown that interaction in collaborative virtual environments is not perceived as equivalent to the face-to-face context (Gilson et al., 2021). According to the *Cues-filtered-out*

theories (Culnan & Markus, 1987) computer-mediated communication [2] in collaborative environments causes nuances, non-verbal cues and contextual cues to be lost, impairing their social and communicative function. Therefore, the use of technology and computer-mediated communication means that, along with the many benefits listed above, there are a number of inherent **challenges** that also arise from its use (Chai & Park, 2022; Hoch & Dulebohn, 2017; Morrison-Smith & Ruiz, 2020).

First, research on this topic has shown that there is a set of challenges linked to the efficient management of the *technical constraints* and *structural features* associated with the technology itself (Curşeu et al., 2008; Morrison-Smith & Ruiz, 2020), as proposed by the Media Richness Theory (Daft & Lengel, 1986). Richness of the medium refers to the ability of a communication medium to transmit multiple verbal and non-verbal cues simultaneously (Walther, 2011). Thus, there will be forms of computer-mediated communication with higher communicative richness (e.g., systems that can transmit images and sound synchronously (i.e., live) and with high quality), and systems whose richness is very limited (e.g., a written messaging system in a forum). Therefore, due to the lower richness of the medium generally found in collaborative virtual environments, failures in the transmission of information, interruptions and misunderstandings are common. These technical limitations can affect the coordination of the task, generate role ambiguity, trigger misunderstandings between members, burnout and cognitive overload (Hertel et al., 2005; Nurmi, 2011). In addition, the use of technology requires specific competencies for its use. The absence of these competencies can be detrimental to its users by increasing work demands (Demerouti, 2020). In other words, the level of technical competence of users may place extra demands on their

[2] We use the term "computer-mediated communication" because of its widespread use, but recent literature has proposed the use of digital or virtual communication, to encompass other tools beyond the computer (Carr, 2020).

intra-role activities. In this line, based on Job Demands-Resources Theory (Bakker & Demerouti, 2017; Demerouti et al., 2001) any organizational characteristic can be turned into a job demand or a job resource. A job demand implies an aspect that requires effort and has an associated psychological cost through the health-impairment process, while increasing resources will improve engagement and positive outcomes through the motivational process. (Bakker & Demerouti, 2017). Based on this, inadequate implementation and management of technology, lack of competences and potential technical problems can lead to increased work demands and lack of resources for members of collaborative virtual environments, affecting their well-being and effectiveness.

Second, another challenge that needs to be addressed when working in collaborative virtual environments has to do with *distance* and the perceived *isolation* of users (Morrison-Smith & Ruiz, 2020; Nurmi, 2011). Geographical and temporal distance between members of a working group affects processes and collective functioning and can have a strong impact on the achievement of their results. Some results show that many users of collaborative virtual environments express loneliness and disconnection (Morrison-Smith & Ruiz, 2020), which leads to significant information losses compared to a face-to-face context (Gilson et al., 2021). In addition, there is more perceived emotional isolation among members due to working physically far away with colleagues whom they may not have met in person (e.g., no informal face-to-face interactions among members) (S. K. Johnson et al., 2009). This perception of isolation has a cognitive and affective component related to members' sense of presence that needs to be managed appropriately (Blanchard, 2021; O'Leary et al., 2014). Thus, in collaborative virtual environments the awareness of peers and their context is reduced (Morrison-Smith & Ruiz, 2020). In consequence, free-riding behaviors (social loafing behaviors) are more likely to occur, in which one or more members of a group exert less effort and contribute less than what they should in relation to the common goal (Monzani et al., 2014). In this sense, if we look at the Social Identity Model of Deindividuation Effects

(commonly known by its acronym SIDE), the role of anonymity and identifiability of group members plays a determining role in the functioning of collaborative virtual environments (Lea & Spears, 1992; Reicher et al., 1995). This theory posits that in virtual environments the potential lack of information and identification of members means that personal identity and individual differences are reduced. In parallel, group attributes and identities become more salient, individuals focus on group norms, and attribution on other members is made on the basis of the little information available (Chan, 2010; Reicher et al., 1995). According to these principles it can be explained why in collaborative virtual environments individual responsibility for outcomes may be blurred. Therefore, the isolation, the lack of information and informal monitoring of the progress of peers can be detrimental to the well-being and effectiveness of the group and its members.

Third, there is also the challenge of achieving efficient *diversity* management, which implies paying attention to the composition of teams or virtual communities. Group composition refers to the way in which individual characteristics are aggregated in the group. Thus, the literature initially explored socio-demographic characteristics of composition and diversity such as gender, education, or background. After this, other measures of diversity such as personality traits became important for their influence on the effectiveness of virtual groups (Mathieu et al., 2014; Taras et al., 2019; Wang & Hsu, 2012). Therefore, variables such as personality (Curşeu et al., 2019; Prewett et al., 2018) or emotional intelligence (Pitts et al., 2012; Quisenberry, 2018) become key to understanding the challenge of how group composition can influence collaborative virtual environments. For the study of group composition of psychological variables, several theoretical approaches have been adopted, such as the contingent perspective or the configurational perspective, considering that the way in which characteristics come together when forming the group will influence the results of well-being and effectiveness (Moynihan & Peterson, 2001). Moreover, the geographically dispersed nature and diversity of virtual groups can make composition a double-edged sword.

While it is true that, as discussed above, diversity of membership in collaborative virtual environments can provide benefits (e.g., more creativity or problem-solving skills (Chamakiotis et al., 2013; Taras et al., 2019)), it is not exempt of risks and challenges, especially if not properly managed. Thus, when two or more diversity characteristics (e.g., gender and educational level) become visible and aligned among group members, diversity faultlines can emerge and generate **subgroups** (Lau & Murnighan, 1998). Similar to the SIDE model, the Faultline Model (Lau & Murnighan, 2005) stems from the Social Identity and Social Categorization theories (Tajfel, 1978; Tajfel & Turner, 1979). Based on the Faultline Model, it is argued that the visible differences that align between members make them perceive themselves as belonging to different social categories. Once these categories stand out, individuals are reinforced and have more positive views of their category (or ingroup), while negative views of the other categories (outgroup) are likely to increase, leading to intergroup biases (Meyer et al., 2011, 2014). That is, perceptions of us versus "the others" are generated. This situation may be more frequent in the collaborative virtual environment because of the different locations, cultural or origin differences; and the lack of contextual cues. These characteristics of virtual environments can make diversity stand out because of differences in resources, knowledge or different personal identities (Carton & Cummings, 2012; Gilson et al., 2015). In this vein, previous literature highlights the negative effects that subgroups can have on teams (Meyer et al., 2014; van der Kamp et al., 2015) and virtual teams (Chiu & Staples, 2013; Gibbs et al., 2017). Thus, subgroups can affect performance and satisfaction, interpersonal conflict and other negative outcomes (Carton & Cummings, 2012; Gibbs et al., 2017). Consequently, it is necessary to study the particular conditions under which subgroups might diminish team well-being and effectiveness and, more importantly, how the faultlines can be deactivated or reduced (Gilson et al., 2015; van der Kamp et al., 2015).

Finally, and partly stemming from the previously stated challenges, the use of collaborative virtual environments influences the emergence and development of *group affect*, sometimes referred to as group emotion (e.g., Kelly & Barsade, 2001) or affective climate (e.g., Gamero et al., 2008) among others. In collaborative environments, such as teams, affect is an essential part of group dynamics (Bell et al., 2018; Gamero & González-Romá, 2020). This group experience is born out of the combination of the individual affective states of the members and the affective context in which they operate (Barsade & Gibson, 1998). Thus, group affect can be understood as an affective experience shared or maintained by the members of the group (Barsade & Knight, 2015).

Group affect plays a major role in team and member outcomes, influencing various outcomes such as satisfaction, well-being, performance, creativity and decision-making (Barsade & Knight, 2015; Druskat & Wolff, 2001; Gamero & González-Romá, 2020). This group affect in virtual environments can be impaired due to the constraints of technology and the resulting interaction (Cheshin et al., 2011; S. K. Johnson et al., 2009; D. Kim et al., 2014; Pitts et al., 2012). For example, Johnson et al. (2009) pointed out that virtual teams experience lower levels of positive affect and engagement, especially if there is a high degree of virtuality. In the same trend, Cheshin et al. (2011) found that virtual teams have higher negative affect, especially in a medium of low communicative richness (written communication).

Facing the challenges of collaborative virtual environments

In the above context, the **affective or emotional management of the team plays** a fundamental role in its functioning in virtual environments. Emotional management of the team involves regulating the emotions of its members during group interaction, calibrating their affect, which can be influenced by contextual, personal and situational factors (George, 1990; Marks et al., 2001). In face-to-face collaborative environments, the development of this

emotional management is done informally and automatically, through verbal and non-verbal cues that occur during the interaction (Ekman, 1974; Ekman et al., 1976). However, in collaborative virtual environments, a series of protocols and explicit rules are required to allow users to express, interpret and manage their emotions (Barsade & Gibson, 2012). Such emotional management can guide team members in understanding which forms of expressing affect are reinforced or sanctioned by the group (Druskat & Wolff, 2001; Kelly & Barsade, 2001) based on their influence on team processes and outcomes. This active explicitness of emotional management enables the team to manage stressful situations by calming frustrated team members or showing empathy (Marks et al., 2001). These and other similar actions proposed can affect the collaborative processes that take place in the framework of the interaction and will impact on the results (Blomqvist & Levy, 2006). Thus, considering the importance of affect and its effective management, there is a clear need to understand how it functions in collaborative virtual environments (Barsade & Gibson, 2012; Gamero & González-Romá, 2020) in such a way as to generate consensus (Hollenbeck, 2008) on the optimal way to promote it in collaborative virtual environments.

Affect management and the other challenges of collaborative virtual environments can be addressed through team development interventions and training (Lacerenza et al., 2018; Salas et al., 2018). In accordance with this, previous research points to the need to continue to design strategies and interventions that prepare team members to work in collaborative virtual contexts (Morrison-Smith & Ruiz, 2020; Peñarroja et al., 2015). However, the data show that only one in four workers have received training to improve their performance in virtual teams (RW3 CultureWizard, 2020) and 40% still struggle to cope with challenges of computer-mediated communication (RW3 CultureWizard, 2022). Interventions can therefore optimize team performance and their own development by addressing any facet of virtual collaboration (e.g., emotional management, reduction of subgroups, communication barriers,

use of specific tools). Moreover, all these training actions can be carried out through virtual collaboration tools thanks to the latest technological developments (Lacerenza et al., 2018).

Intervention: team emotional management training

In view of the above, and taking into account the importance of affect and the emotional management of the team (Barsade & Knight, 2015; Gamero & González-Romá, 2020) as well as the need to develop group interventions (Lacerenza et al., 2018; Parker & Grote, 2020; Salas, 2015; Salas et al., 2018), in the present doctoral thesis we design and test a **team emotional management training in virtual contexts** (Gamero, González-Anta, Peñarroja, et al., 2021)

The designed intervention consisted of a structured training aimed at developing competences for emotional (Lacerenza et al., 2018) for the emotional management of teams in highly virtual contexts, with written communication. In order to design it, we took into account the Social Information Processing Theory (SIP) (Walther, 1992). SIP theory contrasts in part with cues-filtered-out theories and posits that while technology may constrain the transmission of non-verbal and contextual cues, these constraints are due to the temporal and adaptive limitations of communication (Sprecher, 2014). Therefore, it proposes that it is possible to transmit emotional information and that relational communication -oriented towards the establishment of links- despite the limitations. To this end, this theory proposes, first, the principle of *interchangeability of cues*. This principle indicates that when there are missing communicative cues, members adapt their interpersonal and instrumental communication with the cues allowed by the communication medium used. In a medium of minimal richness such as chat communication it is possible for individuals to adapt the encoding and decoding of social information through message content, style and timing. The second principle of this theory is the *aggregation of information over time*. This principle implies that the rate of social information exchange in collaborative virtual environments

differs from face-to-face contexts. As a result, and despite the principle of cue exchangeability, the information transmitted is reduced. In a face-to-face context, signals are transmitted simultaneously through different systems (intonation, voice inflections, facial expressions, double meanings). In computer-mediated communication the limitation of systems means that there is only one primary system or systems doing all the work, thus reducing the quality and increasing the encoding-decoding time (Walther, 2011, 2015).

Taking the fundamentals of SIP theory as a basis, our training aimed to improve virtual teams' ability to (1) identify, express, and regulate emotions in collaborative virtual environments; and (2) manage a positive emotional climate in the team. To this end, the training focused on developing the expression of emotions through the use of different resources such as emoticons (Derks et al., 2008; Skovholt et al., 2014), paralanguage (Kalman & Gergle, 2014) and the temporal management of interactions (Kalman & Rafaeli, 2011). Through the use of these resources, common codes can be generated among team members and facilitate the emergence of norms that manage group affect and interactions (Druskat & Wolff, 2001; Ghuman, 2011). In addition, fostering a positive emotional climate helps to regulate group collaborative processes and improve team performance (Järvelä et al., 2016; Pitts et al., 2012). To this end, various strategies for group affect management were proposed in an online collaborative context. For example, cognitive re-evaluation, mutual support through explicit reinforcement of positive behaviors or formulas to motivate members to achieve goals were proposed (Ayoko et al., 2012; Druskat & Wolff, 2001).

This training was intended to overcome the challenges raised in the previous sections, with particular emphasis on the role of composition and diversity. The presence of subgroups in a virtual team may inhibit the development of communicative cues even if this group interacts for a long period of time (information aggregation principle of SIP theory). However, we propose that training would allow to deactivate the negative effects of subgroups and improve the results thanks to the appropriate intergroup interaction and affective integration

that would take place in the group (Cronin et al., 2011; van der Kamp et al., 2015). Thus, by training these teams in appropriate emotional expression and regulation and providing them with the tools to generate a positive emotional climate, their processes and results can be improved despite the present challenges inherent in their functioning.

OBJECTIVES OF THE THESIS AND STUDIES

This doctoral thesis aims to contribute to the research developed so far in relation to teams and virtual communities. To this end, we set out the following **general objectives:** first, to *study effectiveness and well-being in collaborative virtual environments,* identifying personal and group factors that benefit these results and, second, to design and test an intervention based on the *training in team emotional management* to improve the processes, well-being, and effectiveness of virtual teams.

As indicated above, team effectiveness and team well-being constitute two fundamental outcomes for its functioning and sustainability. On the one hand, team **effectiveness** has been extensively studied in the organizational literature (Hackman & Morris, 1975; Marks et al., 2001; Stevens & Campion, 1994). Traditionally, team effectiveness has been considered as work output in terms of quantity and quality. Subsequently, behavioral reactions and intentions or behaviors of team members such as viability or absenteeism have also been considered (Mathieu & Gilson, 2012). Based on this, we can define effectiveness as the degree of fit between the actions and results obtained by the team; and the standards given by the team or task objectives (Hackman, 1990; Zornoza et al., 1996). Thus, following a systemic approach, effectiveness includes the objective results and the perceived results of the team (Mathieu et al., 2019; Salas et al., 2005). This dual perspective is relevant, since, in the case of collaborative virtual environments, the objective performance or output of the team may be affected by various external factors; and therefore not be sufficient to study or assess the effectiveness of the team (Salas et al., 2005).

Considering this literature, team effectiveness has been operationalized through variables such as team performance or team viability and has been studied at the individual level, at the team level or in broader contexts (García-Buades et al., 2020).

In parallel to effectiveness, when studying groups in virtual environments it is also important to pay attention to the subjective reactions that members experience as a by-product of the interaction (Mathieu et al., 2008). Thus, **well-being** in virtual teams can also be directly influenced by the particular characteristics and challenges of virtual collaboration. (Gilson et al., 2015). Because of this, well-being in virtual teams is considered a central outcome; showing a direct relationship to tangible outcomes and performance (Gilson et al., 2015; S. K. Johnson et al., 2009). Well-being has been conceptualized from two broad perspectives, hedonic and eudaimonic well-being (Fisher, 2010). The former refers to cognitive and affective well-being that is valued in terms of presence of affective positive experiences and satisfying moments. The latter refers to a life perspective in which there is purpose, growth, authenticity and fulfilment (Ryan & Deci, 2001; Sonnentag, 2015). Understanding well-being in our context will therefore require attending to elements of both approaches as part of an overall structure (Peiró et al., 2014). As in the case of effectiveness, well-being can be studied at the individual or team level and through different specific variables (García-Buades et al., 2020). In fact, Kashdan et al. (2008) already highlights the importance of studying specific variables - e.g., satisfaction - as opposed to the use of broad constructs (Kashdan et al., 2008).

Considering the above, the general previously objectives set out are then detailed in a series of **specific objectives** that are embodied in the four articles that form part of this doctoral thesis by compendium of publications. In them, we study the effectiveness and well-being in two collaborative virtual environments: virtual communities (study 1) and virtual teams (studies 2, 3 and 4) in which we test the team emotional management training.

Objective 1 is developed in **study 1** (González-Anta, Orengo, Zornoza, Peñarroja & Martínez-Tur, 2021; hereafter "study 1") entitled ***"Understanding the Sense of Community and Continuance Intention in Virtual Communities: The Role of Commitment and Type of Community***".

Based on the SIDE model, this study analyses how to promote the sustainability of virtual communities through the socio-emotional support and relational processes that arise from the interaction among their members (Blanchard & Markus, 2004; Walther, 1992). Specifically, we studied how the sense of virtual community influenced the intention to continue participating, and the mediating role of commitment. In virtual communities, the active participation of members is necessary for the achievement of community goals (Zhao et al., 2013) and therefore, it is important to promote participation so that the community can develop and be viable (i.e., sustainable). In order to promote it, the importance of a sense of virtual community has been highlighted (Blanchard, 2008; Blanchard & Markus, 2004), but due to the dispersion and anonymity of virtual communities, we also hypothesize that commitment mediates the relationship. In addition, due to the different nature of each type of community (Dholakia et al., 2004), we studied how the structural characteristics affect the relationship. Consequently, we also analyzed the moderating role of the different types of virtual community -virtual communities of interest, learning communities and communities of practice-. The resulting study is shown in figure 1.

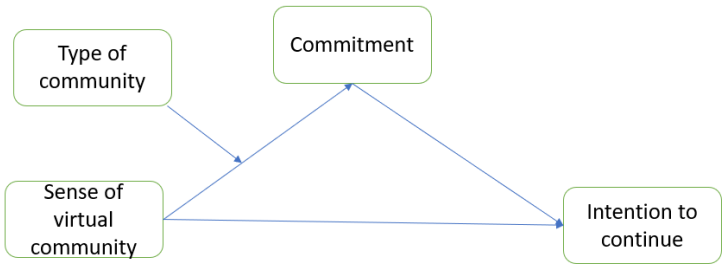

Fig. 1. Theoretical model study 1 (González-Anta, Orengo, Zornoza, Peñarroja, & Martínez-Tur, 2021).

Objective 2 is developed in **study 2** (Gamero, González-Anta, Orengo, Zornoza & Peñarroja, 2021; hereafter "study 2") entitled ***"Is Team Emotional Composition Essential for Virtual Team Members' Well-Being? The Role of a Team Emotional Management Intervention"***.

Based on theories of group affect, this study analyses the effect of group emotional intelligence composition on individual satisfaction with the team and affective states (positive and negative) in virtual teams. In addition, the moderating role of the aforementioned emotion management intervention is studied. The well-being of a group varies depending on the content and the interpretation that the members make of the interaction (Cheshin et al., 2011). Therefore, the individual resources (emotional intelligence) that members bring to the table may be key to understanding well-being in virtual teams. However, as previously stated, the affective context in which the team operates can also influence the team's results in terms of well-being, and this context can be modified through ad-hoc interventions. In this case, through team emotional management training. We also develop a cross-level approach that helps us to understand the complex dynamics of virtual teams (Gilson et al., 2015), providing relevant conclusions about hedonic well-being in these teams. The resulting study is shown in figure 2.

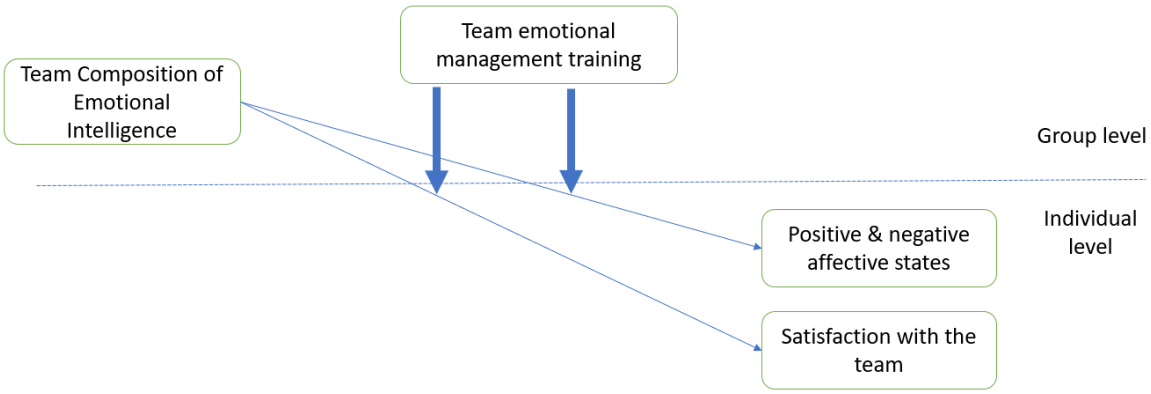

Fig. 2. Theoretical model study 2 (Gamero, González-Anta, Orengo, et al., 2021).

Objective 3 is developed in **study 3** (González-Anta, Orengo, Zornoza, Gamero & Peñarroja, 2020; hereafter "study 3") entitled "***Collaboration and Performance in Virtual Teams with Faultlines: An Emotional Management Intervention***".

This study analyzes the effect of emotional team management training on the performance of virtual teams with subgroups. In addition, we study the mediating role of "team collaboration capability", a construct composed of trust, communication and commitment (Batarseh et al., 2017; Blomqvist & Levy, 2006). Collaboration capability becomes relevant in virtual teams, since, as we explained, they are particularly vulnerable to the emergence of subgroups due to their geographical dispersion and potential multidisciplinary composition. (Gilson et al., 2015; Morrison-Smith & Ruiz, 2020). Therefore, the emergence of subgroups can affect their effectiveness, reduce positive emotional and relational processes (e.g. trust), increase dysfunctional interactions in the team and negatively influence well-being and performance (Meyer et al., 2014; van der Kamp et al., 2015). On this basis, we consider that, while the existence of subgroups may be detrimental to team development and effectiveness, team emotional management intervention will mitigate the potential negative effect of subgroups. Therefore, we hypothesize that the team emotional management training will positively influence the team's ability to collaborate, which in turn will affect performance. The resulting model can be seen in Figure 3. Due to the characteristics of the sample and following recommendations on mediation analysis and the *IMOI* models of group functioning and group efficacy (Ilgen et al., 2005), the effect of the intervention on the mediating variables –team collaboration capability- and the dependent variable -performance- is analyzed at different points in time, providing validity to our results (Mathieu et al., 2008).

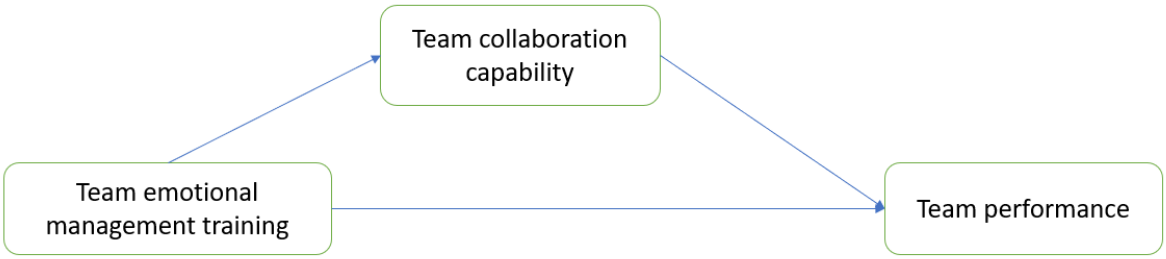

Fig. 3. Theoretical model study 3 (González-Anta et al., 2020).

Objective 4 is developed in **study 4** (González-Anta, Orengo, Zornoza, Peñarroja & Gamero, 2021; hereafter "study 4") entitled ***"Sustainable Virtual Teams: Promoting Well-Being through Affect Management Training and Openness to Experience Configurations"***.

This study is based on the job demands-resources theory (Demerouti et al., 2001) and trait activation theory (Tett & Burnett, 2003) to explore the effect of team emotional management training on group engagement as a well-being outcome in teams with subgroups. Considering that the excessive demands of the virtual environment and lack of resources can be detrimental to well-being, we propose that training can positively influence engagement by providing team members with resources and strategies that facilitate computer-mediated communication. In addition, the moderating role of composition is explored. Specifically, different configurations of openness to experience are analyzed, based on the level (mean) and heterogeneity (standard deviation) of the trait among the team members studied. Based on trait activation theory (Tett & Burnett, 2003), personality traits can manifest themselves in response to situational cues of social nature. Therefore, we consider that the training effect can be modified by the way openness to experience is manifested in the teams. Therefore, there is an optimal configuration of this trait in virtual

teams with subgroups for improving the effects of the training. The resulting study is shown in figure 4.

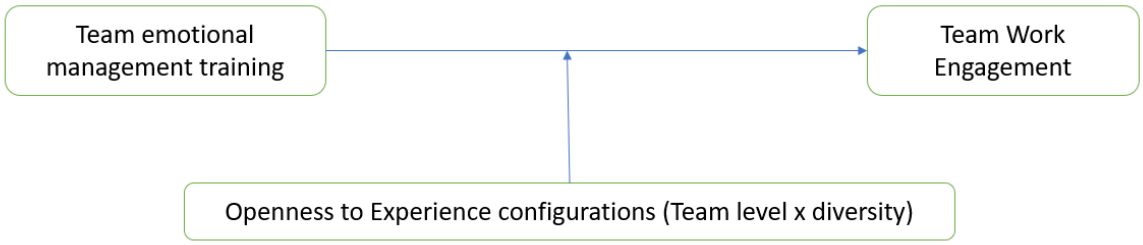

Fig. 4. Theoretical model study 4 (González-Anta, Orengo, Zornoza, Peñarroja, & Gamero, 2021).

METHODOLOGY

Based on the proposed objectives, this thesis combines two research designs in the different articles that make up the thesis. First, a *cross-sectional correlational design* with a sample of virtual communities. This design allows us to study the phenomenon in a real context, and it is a design commonly used in studies of virtual communities (e.g., (J. Kim et al., 2021; Kirkman et al., 2013)). Second, *a quasi-experimental design* with a sample of virtual teams in which we implement team emotional management training to teams with and without subgroups. This second type of design makes it easier to study the impact of the training by having pre- and post-intervention measures and a control group. For this reason, it is common to use experimental designs in the study of virtual teams (e.g., Martínez-Moreno et al., 2015) and with subgroups (Chiu & Staples, 2013). In the following, each of the designs used is specified in detail.

For objective 1, a cross-sectional correlational design was used in study 1. The sample was selected by convenience sampling and consisted of 299 participants from three types of

virtual communities, based on Henri and Pudelko's (2003) typology. First, communities of interest (Facebook or LinkedIn groups; online book clubs, etc.) accounted for 52.8% of the sample. Communities of interest are characterized by very low interdependence, intentionality and low level of shared goals. The second type of community were the virtual learning communities, with common goals centered around a school, subject, didactic topic, etc; with interdependence and intentionality at a mid-point. In this case, learning communities represented 18.1% of the sample and the members belonged to a community formed by students of a distance learning university interacting through a collaborative virtual environment. Finally, virtual communities of practice represented 29.1% of the sample, and were formed by members of a set of Spanish organizations working with intellectual disabilities and developmental problems. These members were interacting through a collaborative virtual environment, focusing on the challenges of their professional practice. Virtual communities of practice are characterized by high intentionality and strong links between members, in which members share experiences and ideas to improve their professional practice (Gannon-Leary & Fontainha, 2007; Henri & Pudelko, 2003). Further information on the methodology of this study can be found in article 1 of the annex.

Regarding ***objectives 2, 3 and 4,*** a quasi-experimental design with virtual teams was designed and carried out, in which, through a randomized controlled trial, training in emotional team management was tested. The methodology of these studies is specified in the following sections. In addition, further information on the methodology can be found in the respective sections of articles 2, 3 and 4 of the annex.

Participants

The final sample of participants was 102 virtual teams, of which half (52 virtual teams) had subgroups. Thus, this study had a final sample of 407 participants, after eliminating missing cases, experimental mortality, etc. The final distribution of participants according to the different experimental conditions can be seen in table 1. Each of these virtual teams was

made up of four undergraduate students from Social Sciences subjects at the Universities of Valencia and Seville (Spain). For ethical and logistical reasons, the participation of the students was voluntary, and the practical activities of the subject was validated by their participation in the study. Team membership was stable during the experimental sessions and participants were not allowed to communicate outside these sessions. The ethical committee of the University of Valencia approved the study, and individual confidentiality of responses was guaranteed to all participants, who signed an informed consent form.

	Intervention group (Team emotional management training)	Control group (waitlist control condition)
Teams with subgroups	26 Virtual teams	26 Virtual teams
Teams without subgroups	25 Virtual teams	25 Virtual teams

Table 1. Final sample.

Design and procedure

This quasi-experimental study used a 2x2x3 mixed factorial design: 2x2 between-subjects (virtual teams with and without subgroups) x 3 within-subjects (pre-intervention, post-intervention 1 and 2, approximately one week apart). Thus, in the research conducted, a randomized controlled trial was used, with pre-post measures and a control group to see if the conditions created had an effect on the team's processes and outcomes. These virtual teams consisted of 4 participants operating in a collaborative virtual environment.

Regarding the collaborative virtual environment, we designed a synchronous interactive computer-mediated communication platform created specifically for this study. This platform was accessed through a website and was available 24/7, allowing members to connect to the experimental sessions and training sessions from any location with a PC and an internet connection, emulating the characteristics of a real virtual team. In this way, participants could

meet and work in a session at any time within the ranges pre-set by the experimental design and at the schedule agreed by the team. This approach to the design fostered the ecological validity of the experiment and also made it possible, due to the different schedules of the different members of each team. This time difference occurred especially in the teams with subgroups, in which the team was made up of members with different academic schedules as they were from different universities. This possibility gives the experiment a closer approach to the complex reality of virtual teams, since the differences in the time zones of the team members often lead to work outside working hours (Bergiel et al., 2008).

Regarding its functioning, this platform allowed the experimental tasks to be carried out -broadcasting videos, activities, questionnaires, instructions, attendance control-. It was also possible to communicate with the administrators if technical problems arose, and more importantly, to interact between team members through a text chat with emoticons and other textual communication resources. Finally, it should be noted that this platform also allowed us to provide the training through it. Team members received the team emotional management training in the platform both at the individual and group level.

For its use, they received instructions and training in a face-to-face session prior to the study. In addition, in this session they answered a baseline questionnaire with various measures such as openness to experience or emotional intelligence. After this, participants were randomly assigned to the virtual teams and the teams were randomly assigned to the control (waitlist control groups) or experimental condition (groups receiving the intervention).

As mentioned above, there was a second experimental condition that consisted of the creation of subgroups. Fifty-two teams had subgroups and fifty did not. In order to create this condition, all participants answered a questionnaire in the informative face-to-face session that was subsequently used to assign a fictitious personality and interests profile called the "adventurous profile". This adventurous profile could be "intrepid/bold" (risk-oriented tastes such as high-intensity sports, sensation seeking, etc.) or "thoughtful" (tastes oriented towards

more calmed leisurely activities). Together with this profile, the university of origin (Valencia or Seville) was combined, creating teams with two members with the same profile and university; and the other two with the opposite profile and university. In other words, a faultline was generated to fragment each team into subgroups based on two diversity characteristics that aligned with each other (Gibson et al., 2014). In addition, the faultlines were exacerbated through a variety of methods such as warm-up activities (e.g., (Rico et al., 2012)) and representative icons (university heraldry) to activate the faultline in case it had not been made explicit (what has been called dormant faultline). Furthermore, it was verified that these subgroups were correctly generated and perceived by the members through specific subgroup identification questionnaires (manipulation checks).

Virtual teams in the experimental condition performed an experimental task (pre-intervention session), then received the training and after this they performed experimental sessions 2 and 3 (post-intervention sessions). On the other hand, teams in the control condition performed all 3 experimental sessions and received the training at the end because of the ethical implications of not offering it to them. However, only data from the 3 experimental sessions in the control condition were used. These sessions were approximately 1 week apart. Thus, including the training explained in the following paragraphs, the study lasted approximately 5 weeks. Figure 5 shows the design graphically for ease of understanding.

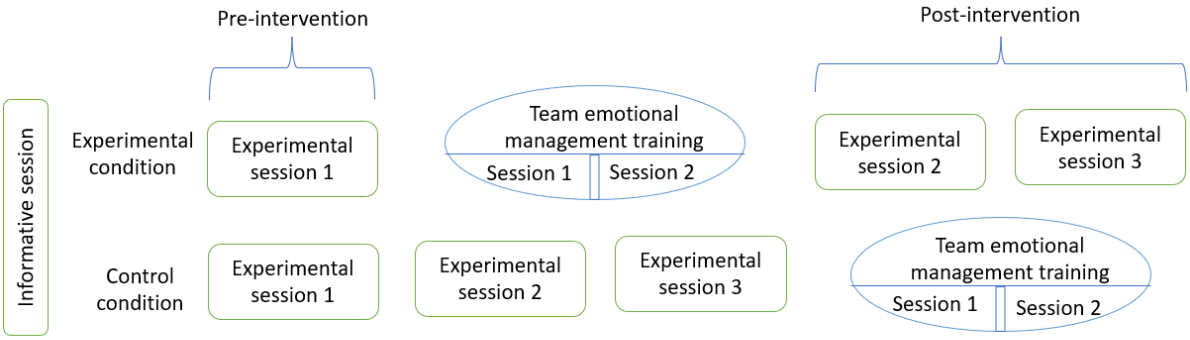

Fig. 5. Experimental design

Experimental tasks

During the 3 experimental sessions, the teams performed intellectual decision-making tasks (McGrath, 1984), specifically what is known as survival tasks in which participants are exposed to a risky situation and have to order a series of objects based on their importance to solve the situation. Thus, these tasks facilitate interaction, as they require combining individual intuitions and cognitions and analyzing the situation together in order to reason the optimal order of objects for survival. In order to make the experiment simpler and more motivating for the experimental subjects, digital storytelling was applied, which means the three survival tasks were articulated in a shared narrative, so that as they performed the experimental tasks they progressed through a story. Three translated and adapted tasks were used: the bushfire survival situation (Human Synergistics, 2018) the nuclear shelter exercise (D. W. Johnson & Johnson, 1994) changing its context to a bunker; and the desert survival problem ("lost in the desert") (Lafferty et al., 1974).

Intervention: team emotional management training

Finally, the team emotional management training consisted of two training blocks, each of which had an individual work session and a group session. These blocks took place between pre-intervention and post-intervention in the experimental condition.

During the individual sessions, participants learned the training content through audio-visual material and practiced it through a series of exercises. After that, in the group sessions, the team worked online synchronously and practiced as a group trying to agree on how to include the training content during the next working sessions (post-intervention sessions).

The contents of the training can be summarized in table 2, which also indicates the theoretical and empirical basis for its development.

<table>
<tr><td colspan="4"><u>Intervention: Online training in emotional management of the virtual team</u>
Principles of SIP theory (Walther, 1992) and theories of group affect and affective management ((George, 1990; Kelly & Barsade, 2001) see Barsade & Knight, 2015; Gamero & González-Romá 2020 for a review).</td></tr>
<tr><td>Block 1</td><td>Identify, express, regulate and share emotions in virtual teams through communicative resources ((Cuadrado et al., 2015; Derks et al., 2008; Glikson & Erez, 2013; Kalman & Gergle, 2014; Kalman & Rafaeli, 2011; Skovholt et al., 2014) among others)</td><td>Block 2</td><td>How to manage and regulate the emotional climate of the team in virtual teams through 5 strategies ((Ayoko et al., 2012; Choi et al., 2015; Druskat & Wolff, 2001; Marks et al., 2001) among others)</td></tr>
<tr><td colspan="2" rowspan="2">- Use of paralinguistic cues (capitalization, use of idioms and onomatopoeia, lexical and vowel substitutes, word spacing).</td><td colspan="2">- Appreciate and acknowledge the efforts and contributions of the other members.</td></tr>
<tr><td colspan="2">- Rewards for success and collective effort</td></tr>
<tr><td colspan="2" rowspan="2">- Management of time, temporal resources and chronemic cues (interpretation and use of pauses and silences, understanding of time in computer-mediated communication).</td><td colspan="2">- Encourage colleagues through messages to motivate them towards the achievement of the group goal.</td></tr>
<tr><td colspan="2">- Use jokes and humor while working</td></tr>
<tr><td colspan="2">- emoticon management (use and interpretation to support, soften or emphasize a written message)</td><td colspan="2">- Re-evaluate negative situations</td></tr>
</table>

Table 2. Summary of the content of the team emotional management training (theoretical-empirical bases).

MAIN RESULTS

First, the results of **study 1** show a partial indirect effect of the sense of virtual community on the intention to continue participating through commitment, a mechanism that mediates the relationship between the two prior variables in virtual communities. In addition, a moderating effect of the type of virtual community is observed. Specifically, the indirect effect was greater in virtual learning communities and virtual communities of interest than in communities of practice, with no significant differences between learning communities and communities of interest.

Second, the results of **study 2** show that emotional intelligence composition positively influences individual satisfaction with the team and negatively influences negative affect, with no significant effect on positive affect. Moreover, team emotional management training partially modulates the results. Specifically, the teams that had been trained did not show a positive and significant effect of composition on team satisfaction. Moreover, the negative effect of composition on negative affect is also no longer significant when the training is applied.

Third, the results of **study 3** show that there is no direct and significant positive effect of team emotion on team performance in virtual teams with subgroups. However, there is an indirect effect of team emotional management training on performance through its influence on trust and commitment. In addition, the three variables that fall under team collaboration capability -trust, commitment, and communication- have a positive effect on performance.

Finally, the results of **study 4** show, first, a positive effect of team emotional management training to increase group engagement in virtual teams with subgroups. Second, the moderating role of personality composition is confirmed. Different personality configurations in virtual teams based on the level and heterogeneity of openness to experience modify the

effects of the training. Specifically, it is teams with high openness level and low diversity that benefit most from training.

CONCLUSIONS AND MAIN CONTRIBUTIONS

Collaborative virtual environments have been gaining prominence in work and personal environments for two decades. Communication and information technologies have benefited society as a whole, providing us with ways to optimize work processes and interaction. As a result, it has been possible to overcome barriers of various kinds and to improve work and personal results not only at the individual level, but also for groups of dispersed individuals who interact partially or completely through technology (Cascio & Montealegre, 2016; Harari, 2018). Recently, due to the COVID-19 pandemic, the growth of collaborative virtual environments (e.g., virtual teams) has been exponential, from relatively modest deployment in some cases to almost total use in some organizations (Newman & Ford, 2021). This has led to a growing acceptance of the use of collaborative virtual environments. In this vein, a recent report shows that 63% of high-growth companies already allow remote working models, and 83% of respondents consider it optimal to work, at least partially, through virtual collaboration environments (Accenture, 2021). This phenomenon, which is part of the "fourth industrial revolution" (Schwab, 2017), triggers an urgency for researchers to understand the impact of the use of collaborative virtual environments in the world around us. But it also forces us to look for ways to guide their implementation, their operation and to maximize their effectiveness while reducing their risks. In this way, we have the opportunity to look beyond collaborative virtual environments as mere tools whose success or failure is beyond us. We can have an impact on individuals, communities and organizations by influencing and optimizing the use of these systems that surround *us* and shape our day-to-day lives (Schwab & Davis, 2018).

Based on this approach, this thesis has tried to make a significant contribution to the field of Psychology and to society. To this end, we have worked on understanding and improving the well-being and effectiveness of collaborative virtual environments, firstly, through their study, and secondly, through the design and testing of a team emotional management training. The conclusions of the studies and those drawn from the thesis are listed below.

First, **study 1** investigated the effectiveness, and particularly the sustainability or viability of virtual communities. Based on the SIDE model, the deindividuation and potential anonymity of virtual communities poses challenges for their optimal sustainability. Therefore, the sense of community and commitment were studied as antecedents of members' intention to participate. From the results, we can conclude that, as expected, the sense of virtual community is important for the viability of the community, but also the commitment of the members makes participation sustainable. Thus, to foster sustainable virtual communities it is important to attend to how members identify with and feel about the community, but also what specific actions they take to strive to support its functioning - i.e., their commitment-. In addition, we concur with previous literature (e.g., (Chang et al., 2016; Meirinhos & Osório, 2009)) in highlighting the importance of exploring different types of virtual communities. The results showed that the indirect effect through commitment was lower in virtual communities of practice than in communities of interest and learning communities. These results lead us to reflect on the role of a sense of community in communities of practice. It is possible that, as some studies point out (e.g., (Gannon-Leary & Fontainha, 2007)), these communities develop more organically and are less transient. Therefore, feelings of belonging and identification with the community play a decisive role, intrinsically motivating members to actively participate. On the other hand, participation in communities of interest and learning communities would be characterized more by individual interests (e.g., participants who want to acquire a central role because of their interest in the topic, or because of an academic qualification) and the potential time limitation of some of these communities. Therefore,

commitment takes on a more active role in these cases. However, these conclusions must be framed within the limitations of the study, and particularly the use of a correlational design, which does not allow conclusions of causality to be drawn, despite the support provided by previous literature regarding the direction of the hypothesized relationships. In any case, these results suggest further exploration of virtual communities in terms of the differences between communities and group processes centered on the nature of the relationship such as commitment and sense of community (i.e., belonging, identity and affiliation), in order to achieve their sustainability.

Second, **study 2** changed the collaborative virtual environment and we investigated well-being in virtual teams. Specifically, the results showed that in virtual teams, emotional intelligence composition positively affected individual satisfaction with the team and negatively affected negative affect, and emotion management training moderated these results. Taking as a reference the group affect approach (Barsade & Gibson, 1998; Barsade & Knight, 2015), we consider that for having an adequate team well-being it is important to understand that affect is born as a combination of individual factors that the members have and contextual factors that happen during the team interaction, as is in this case the team emotional management training. In addition, we rely on the Social Information Processing Theory (Walther, 1992) to configure this training, considering the need for team members to learn to transmit affective information through textual means, as well as to manage the affective group climate, despite the challenges of working in a collaborative virtual environment. The results highlight that compositional models are indeed important for understanding well-being in virtual teams, with particular interest in the role of individual affective characteristics. Furthermore, the results show that regardless of individual attributes, team emotional management training can modify well-being, although it is important to pay attention to which variables or results we want to modify when implementing training, since for example in the case of teams with a high level of emotional intelligence,

training would not play a relevant role. Therefore, we can conclude that the composition of a team in emotional intelligence is a characteristic to take into account when creating virtual teams, but in the case that the levels are not optimal, training in emotional management is a key resource that can help us to improve hedonic well-being. Thus, considering the role of emotional intelligence composition and the effect of training, it will be possible to foster virtual teams whose members are happier.

Third, studies 3 and 4 explored the effect of team emotional management training on the effectiveness and well-being outcomes of virtual teams with subgroups.

Specifically, **study 3** investigated effectiveness in virtual teams, particularly team performance. The results showed that team emotional management training has an indirect positive effect on performance through trust and commitment. These two variables, together with communication, are encompassed in what Blomqvist and Levi (2006) identified as the key variables defining team collaboration capability. Team collaboration capability therefore involves a set of components or processes that can occur in the team and benefit team outcomes through improved collaboration between team members. This framework is of vital importance in virtual teams with a diversity of members (Batarseh et al., 2017). Thus, the results point out to the importance of indirect mechanisms in training effectiveness. Virtual teams, especially if they have subgroups, operate in a highly uncertain and complex environment (Blomqvist & Levy, 2006; Gilson et al., 2015). Therefore, the way the team manages affect and is able to convey emotions across difficulties and diversity, influences how the team collaborates -its trust and commitment processes-. This, in turn, affects the team's perceived performance. In other words, training in emotion management is positive to help virtual teams develop competencies that, thanks to their influence on the team's collaborative processes, make them more productive.

Finally, **study 4** investigated team well-being from an eudaimonic perspective and specifically, explored team engagement as a key well-being outcome. The results showed that team emotional management training had a positive effect on engagement, and furthermore, the way openness to experience was configured in the team (level and diversity) could modify these outcomes. In particular, an optimal pattern of openness was found to exist that makes training more effective in teams with a high level of openness to experience and minimal heterogeneity. Based on the Job Demands-Resources theory (Bakker & Demerouti, 2017; Demerouti et al., 2001), we argue that working in virtual teams that also have diversity faultlines implies an increase in demands that, in the absence of resources, can harm team engagement. From the results, we can conclude that, in order to buffer this effect, the training facilitates the increase of resources to manage group affect. As a result, we were able to make the participants show more interest in the task, in its requirements, devote more time and effort to it thanks to the improved emotional climate, in short, the training allowed us to improve their engagement. In addition to this, based on a contingent configurational approach (Moynihan & Peterson, 2001) and the Trait Activation Theory (Tett & Burnett, 2003), we try to provide consensus-oriented results in relation to the role of openness to experience. Personality in virtual teams remains an underexplored area in the literature, especially as in this study, combined with surface compositional variables such as demographic diversity. Thus, these results partially concur with those of study 2 and show that compositional characteristics play a relevant role in understanding well-being, in this case, eudaimonic well-being. Furthermore, the results point to the usefulness of training to improve team engagement. In this case, a positive effect of training is observed, suggesting that we can make virtual teams more sustainable by training in emotion management and, again, attending to compositional factors.

In sum, this dissertation makes a **theoretical contribution** to the understanding of well-being and effectiveness in various collaborative virtual environments (virtual communities of

different types, virtual teams with and without subgroups). To this end, we have used and made contributions to various theoretical frameworks linked to communication, technology, and computer-mediated communication; groups and their composition; as well as interventions developed within the framework of Organizational Psychology. We have placed particular emphasis on SIP theory and theories of affect, considering that the challenges of technology and computer-mediated communication can be addressed by improving affect management. To this end, we have designed and tested a team emotional management training in which members were trained to acquire different communicative resources and group affect management strategies in a computer-mediated communication context. This training adds further evidence to the body of literature showing the usefulness and effectiveness of team interventions in improving group outcomes (Bowers et al., 2000; Lacerenza et al., 2018), particularly in relation to adaptation to technology (Parker & Grote, 2020). Furthermore, it responds to the need to understand and improve group affect and its management (Druskat & Wolff, 2001; Marks et al., 2001), especially in collaborative virtual environments (Gamero & González-Romá, 2020; García-Buades et al., 2020) through group interventions (Druskat & Wolff, 2001). In addition, our results contribute to the literature that supports the relevance of collaborative processes in virtual teams (Batarseh et al., 2017, 2018), and raises the possibility of differentiating between the processes that are encompassed in the team collaboration capability, as well as exploring new variables that may be included. The results also contribute theoretically to the use of trait activation theory in collaborative virtual environments and the importance of attending different perspectives on group configurations. Specifically, the results highlight the importance of attending to how personality manifests and shapes itself in the team and provide new insights into how different patterns of openness to experience can foster the creation of sustainable virtual teams. Moreover, we make a contribution in the field of virtual communities, as many studies have explored their functioning and outcomes through the study of a particular type of community (e.g., (Chang et al., 2016; Frison & Eggermont, 2016) but there is still a need to

study relational aspects in virtual communities from a comparative perspective, considering how the type of community influences outcomes.

Despite these contributions, there are some **limitations** that establish starting points and new avenues for research that are worth mentioning, beyond the specific limitations of each study. First, this thesis explores well-being and efficacy in collaborative virtual environments of different types but does not do so in a combined way. However, there is an important unexplored area in relation to the intersections between virtual teams and virtual communities. A starting proposal would be to investigate virtual teams embedded within virtual communities. In addition, the study of other types of virtual environments would also shed light on this research question. For example, multi-team systems are generally referred to in the literature, but their research is still at an early stage (Salas et al., 2018; Turner et al., 2020). Furthermore, the study of virtual teams in this thesis is done by means of a randomized controlled trial design through computer-mediated communication. This quasi-experimental design with different measurement times contributes to the robustness of the conclusions and allow us to partially suggest causal mechanisms. In addition, it increases ecological validity by partially simulating a real virtual collaboration context. However, it also partly limits our ability to control for all possible extraneous variables. Moreover, thanks to advances in technology and the current work reality, it will become increasingly common for virtuality to be considered as a characteristic of teams, and therefore the focus of the study will be on the virtuality of teams (Alves et al., 2022; Handke et al., 2021). Consequently, the focus of study is moving towards blended or hybrid teams (Klonek et al., 2021), where the expectation is to work partly through virtual and partly face-to-face environments (Accenture, 2021; Alves et al., 2022). In this hybrid context it will be necessary to explore again the role of group affect and emotional expression (Alves et al., 2022).

Considering the findings, and despite the limitations and scope of our studies, **practical implications** can also be drawn for use in the field of applied psychology**.** The management

of virtual teams and communities presents a number of challenges for organizations that use and benefit from the use of collaborative virtual environments.

Firstly, in order to achieve sustainable online communities, it is important to retain members and encourage their participation. To this end, online community managers should design communities and interactions with members in a way that fosters their feelings of membership, identification and belonging. For example, it is important to create spaces that allow for the development of online identities, facilitate interaction and create a warm environment for participants. Alongside this, it is important to encourage the participation of people who show behaviors of commitment with the community, such as greater and more meaningful participation. This element will be particularly important depending on the type of community. Thus, while in communities of practice the sense of belonging and identity are key to participation, in communities of interest and learning communities the commitment of the members plays a more relevant role.

Secondly, in order to achieve functioning and sustainable virtual teams, it is first necessary to address the characteristics of their members. Virtual team managers could create teams by addressing the risk of diversity gaps, thus avoiding the alignment of demographic characteristics that could lead to subgroups. In addition, when selecting team participants, it will be more beneficial to their well-being if they have high levels of openness to experience and emotional intelligence. However, selecting team members on the basis of demographic or psychological characteristics is not always possible, as economic and/or functional criteria often take precedence (e.g., virtual teams of members of the same company with different locations). Moreover, even with an optimal composition, many teams need to develop competences for adequate teamwork (Lacerenza et al., 2018; Salas, 2015), especially linked to digital competences. This may place additional demands on the job and cause various negative effects, at least in the short term (Demerouti, 2020).

Considering the aforementioned, it is important for organizations to invest resources in interventions and training (Parker & Grote, 2020). Specifically, it will be positive to develop emotional competences with which to face the potential challenges of composition and technology. Thanks to the proposed training, members improve their skills in expressing emotions, interacting, expressing themselves, understanding their colleagues and managing the emotional climate even if there are difficulties in conveying their emotions and relating, such as in a chat exchange or through emails. Moreover, this training has the added advantage of being designed in a format intended for online implementation and of short duration (two blocks in two training sessions), as has been done in the studies of this thesis. In other words, it is a useful contribution to the field of online training. In this way, its use in the work context is facilitated, as workers can access it from anywhere with an internet connection and it involves a minimal investment of time that hardly interrupts their working day. Thanks to the training, team results are improved, as well as the collaborative processes that take place in the team, specifically the trust and commitment of the members. Therefore, the implementation of this training is recommended not only for its positive results, but also for the improvement of team functioning.

In short, the results obtained in this doctoral thesis allow us to conclude that collaborative virtual environments bring benefits to organizations and individuals, but they are not free of challenges due to the limitations of technology and the way of interacting in these environments. It is therefore important to understand and optimize their functioning in order to improve outcomes for the different actors involved. Research conducted shows that to understand well-being and effectiveness in these environments, it is important to consider the characteristics of the members, the type of structure, the processes and relational aspects of the group. Furthermore, to improve well-being and effectiveness, a short online training in team emotional management has been proposed which, through its interaction with various factors, has made it possible to foster sustainable, happy, and productive collaborative virtual environments.

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