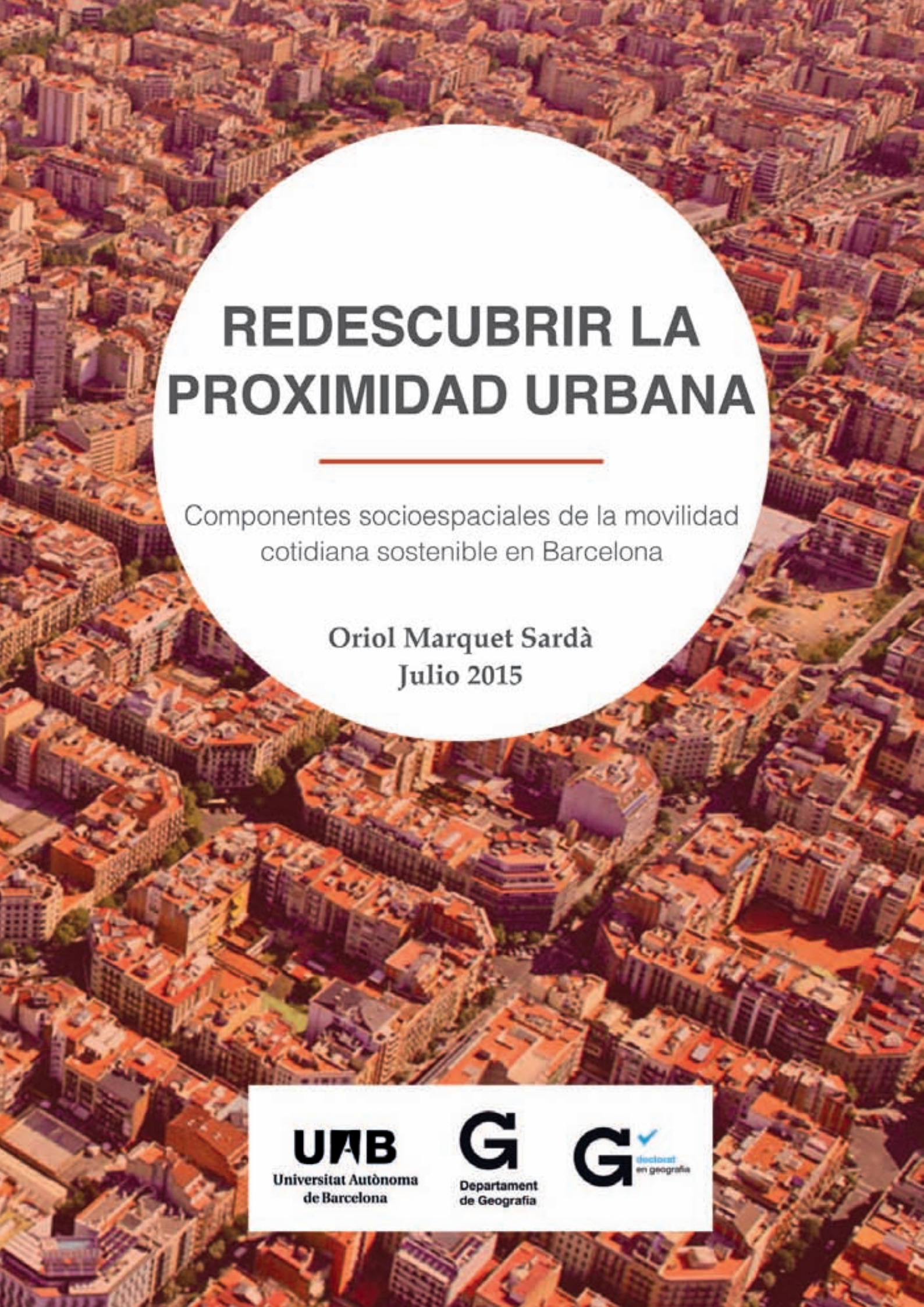

REDESCUBRIR LA PROXIMIDAD URBANA

Componentes socioespaciales de la movilidad cotidiana sostenible en Barcelona

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Julio 2015

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CAPÍTULO 8

Conclusiones

Descubriendo los viajes de proximidad

El objetivo principal de esta tesis era profundizar en el conocimiento de las dinámicas de proximidad en la ciudad y la Región Metropolitana de Barcelona analizándolas desde el punto de vista de la movilidad cotidiana de la población. Para conseguirlo, el primer obstáculo a superar, y también el primer hallazgo de esta tesis, ha sido llegar a identificar los desplazamientos de proximidad desde una fuente de datos de tipo encuesta de viaje.

Las encuestas de viaje, que son aún la fuente de datos básica en la mayoría de trabajos sobre movilidad y transporte, proporcionan mucha información acerca del desplazamiento pero en su gran mayoría no incorporan la variable distancia recorrida en cada viaje. Por tanto, utilizar una fuente de datos de movilidad para evaluar el uso de la proximidad que hacen los ciudadanos de la Región Metropolitana de Barcelona implicó como paso previo diseñar un *proxy* -un indicador aproximado- utilizando las variables que sí estaban disponibles en la encuesta.

Este indicador de movilidad de proximidad se ha conseguido utilizando las variables tiempo de viaje y elección modal, y se expresa en la ecuación:

Proximidad = desplazamiento andando + desplazamiento de menos de 10min

Con esta ecuación ha sido posible observar que casi uno de cada cuatro desplazamientos que se producen en la ciudad de Barcelona cumple con estos criterios que en términos de distancia equivale a recorrer entre 650 y 800 metros. Pero las implicaciones de este tipo de desplazamiento no se limitan a la distancia recorrida, sino que por ser un indicador compuesto, también estamos tratando con las implicaciones de un viaje breve, y las implicaciones de un viaje a pié. Lo que esta tesis ha bautizado como un viaje de proximidad es en realidad un tipo de viaje de características muy especificas pero que es inmensamente común en nuestra movilidad cotidiana. La potencia como indicador del viaje de proximidad no es pues solo la distancia recorrida, sino la suma de las tres variables: distancia corta, tiempo breve, modo asequible.

¿Qué es lo que estamos observando realmente cuando la EMQ06 nos indica que el 24% de todos los desplazamientos en día laborable en Barcelona son hechos a pié y en menos de 10 minutos? Estamos observando un tipo de movilidad sostenible en todas sus acepciones. Un tipo de movilidad cotidiana que es respetuosa con el medio ambiente y que consume comparativamente menos recursos (demostrado por la literatura, capítulo 5.2); un tipo de movilidad que está al alcance de todos los tipos de población y que precisamente es utilizada en mayor medida por aquellos sin acceso al vehículo privado y con necesidades horarias más complejas (demostrado por la literatura y en el estudio de Caso 2); y también un tipo de movilidad que es saludable porque aumenta nuestra actividad física diaria (demostrado por la literatura y en los estudios de caso 3 y 4). Por si eso no fuese suficiente, esta tesis también demuestra que la movilidad de proximidad es económicamente productiva, tanto para el rendimiento comercial de nuestro espacio urbano, como en términos empresariales y de capital humano (demostrado por la literatura, capítulo 5.4). Por último, esta tesis también ha demostrado –en el que en mi opinión es otro de los principales hallazgos- que este tipo de movilidad no es una quimera, no es un sueño de ambientalistas y sociólogos, sino que este tipo de movilidad está muy presente en nuestro día a día (demostrado en el estudio de caso 1).

Proximity everywhere

Aún en la época de la *automobility*, de las TIC y de las grandes áreas metropolitanas, la realidad es que la movilidad de proximidad es la constante invisible de la ciudad, el latido que hace funcionar nuestra vida cotidiana. Tal y como indica Jouffe (2011) son los micro desplazamientos dentro del barrio los que nos proporcionan la posibilidad de una movilidad metropolitana de mayor escala.

Para muchas personas, la posibilidad de realizar tareas cotidianas como el ir a comprar, llevar a los hijos al colegio o visitar amigos y familiares dentro de la escala del barrio mediante desplazamientos de proximidad es lo que hace posible asumir un desplazamiento de 30 o 40km hasta el lugar de trabajo. En otros casos, la movilidad de proximidad no es un requisito indispensable para la vida cotidiana sino que proporciona un mayor bienestar ya que gracias a poder desplazarse hasta ciertas actividades con un desplazamiento de proximidad se ahorra tiempo que puede ser reinvertido en mayor tiempo de actividad o en más actividades. La proximidad es importante incluso para aquellos que realizan todos sus desplazamientos en medios motorizados puesto que gracias a que

otros se mueven utilizando desplazamientos andando los conductores pueden moverse con niveles aceptables de congestión, y los usuarios del transporte público pueden utilizarlo sin sentirse hacinados.

A pesar de nuestra obsesión por los viajes de larga distancia, por la velocidad y las infraestructuras, la realidad de una ciudad como Barcelona es que la proximidad es casi omnipresente en nuestra movilidad cotidiana. Las zonas de Barcelona con un menor uso de la proximidad aún cuentan con casi un 20% de desplazamientos de este tipo (caso de estudio 1), mientras que el grupo social que menos usa este tipo de viajes (hombres empleados de entre 30 y 64 años) aún lo usa para el 17% de todos sus desplazamientos (caso de estudio 2). Para algunas zonas de Barcelona, la movilidad a pié y de corta distancia representa hasta un tercio de todos los desplazamientos (caso de estudio 1), mientras que para algunos grupos sociales (desempleados/as de entre 30 y 44 años) esta tasa de utilización se dispara hasta representar el 38% de toda su movilidad (caso de estudio 2).

Los resultados de los casos de estudio 1 y 2 ponen de manifiesto esta importancia de la proximidad y confirman en parte las tesis de Vincent Kauffmann (2008) conforme el ámbito de la proximidad es el ámbito central, no el negativo. La proximidad no es aquello que nos queda cuando hemos resuelto los desplazamientos de larga distancia –considerados por la *transportística* tradicional como los *importantes*- sino que es nuestra capacidad de movernos localmente lo que nos permite recorrer mayores distancias para algunos motivos de viaje. Este argumento no nos tiene que llevar a despreciar la importancia de la movilidad de larga distancia, cuyo peso es innegable en la sociedad urbana actual, sino a entender que distancia y proximidad, velocidad y lentitud, son dos caras de la misma moneda (Lazo, 2012).

Proximidad no implica Hong Kong

A pesar de que el aspecto espacial de la proximidad tiene que ser aún explorado del todo, el estudio de caso 1 demuestra que para generar movilidad de proximidad no se requiere de densidades de población desorbitadas. Este hallazgo supone un apoyo para refutar la creencia que asocia ciudad compacta con rascacielos y altas densidades similares a las grandes metrópolis asiáticas. El caso de Barcelona demuestra que la forma urbana necesaria para generar movilidad sostenible no se caracteriza por grandes densidades de población, sino por una trama urbana homogéneamente densa y de desarrollo compacto

(Owen, 2009, p. 127). La cuestión tal y como la plantea Ng (2010, p. 36) no es demonizar la densidad sino entender qué nivel de densidad mínimo necesitamos para aumentar la sostenibilidad de nuestras ciudades. La respuesta a esta pregunta en el caso de Barcelona es que no existe evidencia alguna según la cual por encima de 20.000 hab/km2 el uso de la proximidad aumente con la densidad de población. En Barcelona 45 de los 73 barrios se hallan por encima de ese umbral de densidad mínima, entre ellos barrios acomodados como San Gervasi, L'Esquerra de l'Eixample o Les Corts (Ajuntament de Barcelona, 2015), lo que nos indica que no debemos identificar proximidad con extrema densidad de población, o baja calidad de la urbanización. El estudio de caso 1 no permite establecer con precisión, el punto exacto en el que se produce una disassociación entre densidad de población y uso de la proximidad, pero sí permite entender que lo que se necesita es una densidad mínima que concentre en un radio de 650-800 metros el suficiente número de destinaciones potenciales para convertir el viaje de proximidad en una opción atractiva. A partir de ese umbral mínimo la literatura indica que otros factores espaciales, como la conectividad, la mezcla de usos y el diseño urbano también afectan al comportamiento móvil de la población.

Proximity, it's a social thing

Otro de los hallazgos de esta tesis es que las variaciones en el uso de la proximidad en Barcelona no las determina tanto el espacio –que es altamente homogéneo- sino la estructura socioeconómica y el perfil demográfico del individuo. El estudio de caso 2 se centra exclusivamente a explorar esta relación y de él se pueden extraer dos conclusiones fundamentales.

La primera es que la proximidad se usa principalmente para los desplazamientos de tipo personal. Esto es consistente con la literatura en el hecho que estamos predispuestos a invertir mayores tiempos y costes de desplazamiento para cubrir actividades relacionadas con el trabajo (Best & Lanzendorf, 2005; Mokhtarian, Salomon, & Singer, 2015). Los desplazamientos personales que en muchos casos son de carácter opcional o recreativo buscan ser resueltos dentro del ámbito de la cercanía, y esta tendencia se reproduce por igual en todos los grupos sociales (todos los grupos solventan sus viajes personales mediante desplazamientos de proximidad entre el 29 y el 36% de las veces. Ver estudio de caso 2). Esta regularidad explica porque los grupos sociales con un mayor número de desplazamientos de tipo personal son también los mayores usuarios de la proximidad.

La segunda observación importante que se puede extraer del análisis social del uso de la movilidad de proximidad es que en el caso de Barcelona, la proximidad no se relaciona con la exclusión social –como puede ser el caso de la estructura de movilidad de las ciudades latinoamericanas- sino con un aumento de la movilidad y por tanto del bienestar. Las personas (de entre 16-64 años) que declaran realizar un desplazamiento de proximidad realizan 1.87 viajes más al día que aquellas que no realizan ningún viaje de este tipo. Eso nos indica que el tiempo/coste ahorrado gracias a la proximidad no es utilizado para hacer solo los viajes de necesidad básica sino que es reinvertido en una actividad adicional.

El hecho que los mayores ratios de uso de la movilidad de proximidad se hallen entre los grupos sociales sin acceso al coche, también demuestra que para un tercio de la población en edad activa de Barcelona la vida cotidiana es posible sin acceder en ningún momento al vehículo privado, gracias a un uso más intensivo de la movilidad de proximidad. Es especialmente significativo que las principales diferencias en el uso de la proximidad entre aquellos con acceso al vehículo privado y aquellos que no tienen acceso a él se localice en la movilidad ocupacional. A falta de un análisis completo, los datos sugieren que el poder desplazarse al trabajo mediante un desplazamiento de proximidad es un factor determinante a la hora de poder prescindir del vehículo privado. Este hallazgo supondría un aliciente para políticas orientadas a mejorar la distribución de los puestos de trabajo y un argumento a favor de políticas de mezcla de los usos del suelo orientados a vivienda y a oficinas.

Proximidad y salud

Los resultados de los estudios de caso 3 y 4, que vinculan la proximidad con una menor inmovilidad, mayor número de actividades y minutos andando al día para los casos de la población mayor y la población infantil muestran claramente las ventajas de la proximidad en términos de salud pública. Son especialmente relevantes porque tratan dos grupos de población con necesidades especiales de movilidad y sectores igualmente vulnerables. Se trata de dos grupos que están directa o progresivamente excluidos del uso del vehículo privado por motivos de edad y capacidad, lo que los convierte en grupos al margen de la mayoría de políticas de gestión del sistema de transporte. Además de ser grupos tradicionalmente silenciosos con limitada capacidad de hacer oír sus necesidades en el debate político, son grupos de especial interés, los unos por ser el futuro de la

sociedad y los otros porque son un grupo social cada vez mayor en vista de las dinámicas demográficas de envejecimiento de la mayoría de países occidentales.

Por todo ello el estudio de estos grupos de población no busca solo completar un análisis de la movilidad que ha tratado con toda la población mayor de 16 años (caso de estudio 1) y con la población en edad activa (caso de estudio 2) sino también tratar específicamente sus condicionantes y necesidades para la movilidad cotidiana. Los resultados van más allá de remarcar que niños y ancianos son los principales usuarios de la movilidad de proximidad, y muestran el poder transformador del entorno urbano en la construcción de hábitos de vida saludables. El análisis además de señalar los efectos negativos de vivir en áreas diseñadas en base a la distancia, identifica claramente los beneficios intrínsecos de utilizar la movilidad de proximidad.

En conjunto, los resultados de los cuatro estudios empíricos demuestran la importancia de la movilidad de proximidad en múltiples aspectos de la vida cotidiana, desde su distribución territorial a su distribución en todos los grupos sociales, desde la población activa, a la población infantil o la mayor de 65 años. Los resultados también muestran importantes matices en términos de edad, género y usos de los principales modos de transporte, dando una visión general del uso de la proximidad en el Municipio y el Área Metropolitana de Barcelona. Al mismo tiempo la estructura del análisis empírico en forma de estudios de caso ha hecho posible profundizar en aspectos temáticos de la proximidad –distribución territorial, perfil socioeconómico de sus usuarios, efectos sobre la salud- permitiendo un nivel de detalle que no hubiese sido posible con otros métodos de análisis. Eso significa sin embargo que también quedan muchos aspectos a explorar.

Uno de los campos con más recorrido es sin duda la relación entre la movilidad de proximidad y las estructuras espaciales de la ciudad. Si bien el estudio de caso 1 realiza una primera incursión exploratoria en este campo, resulta indudable que una mayor variedad de indicadores espaciales así como el estudio de áreas de estudio espacialmente heterogéneas permitiría un análisis mucho más detallado. Otro aspecto especialmente interesante es explorar las relaciones entre el uso de la escala local y la escala metropolitana. Utilizando herramientas de la Geografía del tiempo esta línea de investigación debería permitir analizar con claridad si estamos utilizando la proximidad como forma de ahorrar tiempo o si por el contrario la utilizamos para poder aumentar el número de actividades diarias. Por último la relación entre presencia de movilidad de proximidad y

productividad económica está claramente aún por resolver. Este es un punto importante en el análisis teórico, pero por falta de fuentes de datos adecuadas, ha sido imposible incorporar la dimensión económica al análisis práctico.

En conjunto, puede que la fuerza de la proximidad no se halle en los resultados que se obtienen por separado en un aspecto concreto, sino en su capacidad de actuar de forma transversal en múltiples aspectos de la vida en la ciudad. La fortaleza de la proximidad es que suma en todos los aspectos de la sostenibilidad urbana, e influye especialmente en los dos grandes temas de la ciudad contemporánea: la sostenibilidad ambiental y la desigualdad (Tonkiss, 2013, p. 32). La capacidad de crear entornos donde sea posible moverse sin el vehículo privado, reduce los niveles de emisiones al mismo tiempo que crea entornos menos desiguales en cuanto a accesibilidad. Apostando por la proximidad como principio-guía para nuestras ciudades evitamos elecciones difíciles dentro de la dualidad "necesidades sociales vs necesidades medioambientales". La proximidad demuestra que se puede planificar con objetivos sociales al mismo tiempo que reducimos los impactos medioambientales de nuestra movilidad. Por si esta complementariedad fuera poco, este trabajo también ha demostrado que un sistema de movilidad basado en los desplazamientos de corta distancia en modos no motorizados puede generar importantes beneficios económicos, desde un punto de vista de productividad, de innovación y también de ahorro de costes médicos y sanitarios derivados de una menor contaminación ambiental y del fomento de hábitos de movilidad más saludables.

CAPÍTULO 9

Discusión general y reflexión final

Las evidencias empíricas han llevado a que la proximidad y el desarrollo urbano compacto empiecen a ser considerados ortodoxia del buen diseño urbanístico. Pero tal y como nos advierte Fran Tonkis (2013, p. 181), la proximidad no es un fin en sí mismo sino un medio para alcanzar valores que consideramos deseables para nuestras ciudades: sostenibilidad, equidad, bienestar y productividad. Es importante en este punto recordar a Jane Jacobs, cuando afirma que no existe tal cosa como demasiada proximidad o densidades demasiado bajas. La densidad o la proximidad solo son herramientas al servicio de la creación de unos ciertos valores urbanos. El grado de proximidad o de diversidad dependerá de los objetivos que nos marquemos como sociedad. Si como parece, los valores hacia los que queremos avanzar son los de la sostenibilidad ambiental y social, entonces la movilidad cotidiana y la gestión del transporte urbano devienen en una prioridad. Las propuestas de esta tesis deben leerse en el contexto en que el objetivo común es la construcción de un modelo de movilidad sostenible, y por tanto sus propuestas son muy distintas a las que pudieran surgir si el objetivo principal fuese reducir los tiempos de desplazamiento al mínimo, proveer al usuario de la mayor libertad individual posible o promocionar una mayor riqueza material.

Una de las principales conclusiones de esta tesis es que el modelo de transporte tiene potencial para generar una gran cantidad de externalidades positivas tanto para la sociedad como para el medio ambiente. Existe mucho margen de mejora en la forma en que gestionamos y diseñamos la movilidad, puesto que hasta hace relativamente poco, hemos tratado el movimiento entre actividades como un mero resultado de la configuración espacial y temporal de nuestras ciudades. Una configuración que calificábamos de sagrada e intocable. Esto ha provocado que hayamos tratado el transporte de forma sectorial, como una demanda fija con una sola variable -la voluntad de desplazamiento de los ciudadanos- y sin vínculo alguno con la forma urbana o las necesidades móviles de cada población.

En cuanto se ha hecho evidente que la demanda de transporte no es fija sino que fluctúa en base a múltiples factores, se ha hecho evidente también la necesidad de cambiar

la forma en que gestionamos el transporte desde un modelo de tipo *predict and provide* basado solo en gestionar la demanda existente, hacia un modelo basado en modular y tratar dicha demanda mediante el conjunto de herramientas al servicio de la planificación urbana (Bertolini et al., 2008).

Esta tesis ha demostrado que tratar la movilidad de forma aislada sin tener en cuenta sus condicionantes espaciales como la densidad, la mezcla de usos o aspectos socioeconómicos como el uso del tiempo o el acceso al transporte privado es tratar el problema de forma sesgada. Debemos tratar al transporte y a la planificación de los usos del suelo de forma integrada. La entrada en el nuevo paradigma de la sostenibilidad, no solo cambia el objetivo de la planificación del transporte -de la *velocidad* a la sostenibilidad-, sino que también cambia las formas en que planeamos, las variables y las metodologías que utilizamos. Más importante aún, el nuevo paradigma nos impulsa hacia una necesaria multidisciplinariedad, en que la política, la transportística el *urban planning* y la salud pública trabajen de la mano con el objetivo de crear las condiciones necesarias para la movilidad sostenible.

Nuestro rol como planificadores

Sin embargo, existen innumerables advertencias en la literatura en contra de la extralimitación del planificador en busca de la solución directa de los problemas de cada tiempo. Por buenas que puedan ser las intenciones, planificar el entorno urbano y el sistema de transporte pretendiendo ser a la vez sociólogo, político y economista no nos deja muy lejos de otras figuras hoy denostadas como Robert Moses, Le Corbusier o el urbanismo soviético (Tonkiss, 2013, p. 18). El punto opuesto sin embargo tampoco es deseable. Henri Lefebvre ya advertía en el año 1970 de la futilidad de los esfuerzos de planificación cuando lo urbano se convierte en solo un objeto de análisis y se abandona por completo la estrategia urbana para el cambio social (Lefebvre, 1970, p. 75). Planificadores y analistas de lo urbano deben tener responsabilidad sobre los resultados sociales que genera su obra. Se impone así la necesidad de un punto medio entre el análisis desligado de la realidad urbana y la planificación arrogante.

Al considerar los factores determinantes de la movilidad cotidiana, estamos entendiendo la movilidad individual como el resultado de las necesidades sociales y las posibilidades del entorno, y visualizamos claramente que la movilidad se estructura a partir

de una serie de restricciones espaciales y temporales. Este es un enfoque estructuralista que de llevarlo al extremo nos conduciría a considerar el individuo como un mero autómata dirigido por condicionantes externos (Cresswell, 2013, p. 200). Reconocer las relaciones entre movilidad y forma urbana, y movilidad y factores socioeconómicos no significa que la estructura determine por completo la movilidad individual ni que del análisis estructural podamos predecir o entender del todo la movilidad cotidiana. Debemos tener en cuenta también el papel de la agencia, el rol central y activo del individuo a la hora de decidir y configurar su movilidad cotidiana. El enfoque de esta tesis es pues ligeramente posestructuralista y más de tipo posibilístico o probabilístico. Este tipo de razonamiento consiste en pensar que las restricciones de tiempo y espacio ofrecen unas determinadas posibilidades de movilidad a la población, pero que cada individuo desde su elección personal subjetiva, termina eligiendo una u otra estrategia móvil (Næss, 2015). O lo que es lo mismo, que el hecho que los barrios densos, compactos y con diversidad de usos, *permitan* la movilidad de proximidad, no significa necesariamente que la población que los habita *utilice* la movilidad de proximidad. De hecho, numerosos estudio demuestran que no siempre escogemos la destinación más cercana a nuestro alcance (Mokhtarian et al., 2015), ni el puesto de trabajo a menos distancia de nuestra residencia (Haugen et al., 2012). Esto indica que no siempre que existan las condiciones necesarias para la proximidad se van a generar las dinámicas de proximidad altamente sostenibles que ha descrito esta tesis. Aún sabiendo esto, el deber del planificador es proporcionar el entorno adecuado para que la movilidad de proximidad sea una opción de movilidad más, al alcance de la mayoría de la población. Porque de lo que sí tenemos una certeza absoluta es de que sin las condiciones necesarias, no se pueden producir dinámicas de proximidad y movilidad sostenible.

Palancas de cambio

Con ese objetivo en mente –como conseguir entornos urbanos que permitan patrones de movilidad sostenible- una de las enseñanzas más importantes de este trabajo ha sido constatar el vínculo entre movilidad de proximidad y bienestar, y entre proximidad y eficiencia económica. Estos dos elementos expanden el argumento a favor de la movilidad sostenible más allá de la sostenibilidad ambiental. Esto es importante porque tal y como explican Montgomery (2014, p. 102) y Klein (2014), es difícil encontrar un problema mejor diseñado para provocar inacción que el Cambio Climático. Más allá de que parte de la población aún no está convencida de su existencia, los peligros que presenta el

cambio climático no son suficientemente evidentes como para desencadenar una reacción. Sus efectos son demasiado lejanos de la vida cotidiana de la mayoría de personas y la complejidad del sistema climático hace difícil establecer un sistema de causa-efecto fácilmente identificable. Además, las principales víctimas de los primeros efectos de la crisis climática son muchos de los países del sur global, lo que tampoco ayuda a la movilización social en contra del cambio climático.

En este contexto las iniciativas orientadas a apelar a la responsabilidad de los ciudadanos fracasan constantemente puesto que, como bien saben los publicistas, las campañas basadas en el miedo y la culpa no funcionan. Del mismo modo, las acciones gubernamentales que intentan penalizar los comportamientos nocivos son muy mal recibidas y vistas como una coartación de las libertades individuales (Steg & Gifford, 2005). Es necesario pues recurrir al interés propio para forzar cambios de hábitos relevantes tanto a nivel individual como para el conjunto de la sociedad. La ciudad y la movilidad sostenible tienen que ofrecer más y mejor que el modelo actual, tienen que ser más atractivas a ojos de la población para hacer que se desee vivir en el centro vibrante de una ciudad antes que mudarse a una urbanización metropolitana (European Urban Knowledge Network, 2007). En este contexto los hallazgos que apuntan que la vida en proximidad aumenta nuestra felicidad y nuestro bienestar –aún cuando no siempre seamos conscientes de ello- son de vital importancia.

Aun así, y tal y como ya enunciara Lefebvre, *no social revolution can succeed without being at the same time a consciously spatial revolution* (citado por Soja, 1989, p. 92). No se puede aspirar a cambiar las formas de conducta y de movilidad del conjunto de la sociedad sin entender la necesidad de afrontar cambios en la forma espacial de la ciudad. En este contexto, y dado que la producción del espacio urbano sigue en manos de las dinámicas del capital, las ventajas de la proximidad en términos de productividad descritas en el Capítulo 5.4 son también cruciales para incentivar el cambio hacia el desarrollo urbano compacto. Tal y como ya hemos visto, la proximidad afecta a la productividad global de una ciudad de tres formas distintas: promoviendo la capacidad de innovación de las empresas, aumentando los rendimientos comerciales y concentrando la población altamente cualificada. Tres elementos que pertenecen al ámbito microeconómico que alimentan el motor de la competitividad (Tinguely, 2013, p. 90). Promocionar estos elementos y vender el desarrollo compacto como un tejido económicamente productivo es un aspecto crucial para implicar a las fuerzas económicas al proyecto de modelos de movilidad más sostenibles.

El objetivo final debe ser hacer atractiva la proximidad y la ciudad compacta desde un punto de vista tanto individual como económico. Este punto es especialmente importante ya que tal y como denuncian Barr & Prillwitz (2012) en los últimos años, las políticas medioambientales se centran en modificar las pautas de consumo de transporte de la población. Estas políticas hacen recaer la responsabilidad de la movilidad sostenible en la elección modal del individuo y en la confianza que el *buen ciudadano* optará por medios no contaminantes al desplazarse si se le incentiva a hacerlo. Este razonamiento oculta –intencionadamente o no- la responsabilidad de la forma urbana, la política de transportes y la localización de las infraestructuras en la elección final del individuo, y por tanto inhibe de responsabilidad a las grandes fuerzas económicas y políticas en el diseño de una forma urbana que permita y promueva activamente los medios de transporte sostenibles.

Una de las grandes ventajas de la vida en proximidad es que se generan externalidades positivas de forma inconsciente, que son sumamente eficientes porque no requieren de cambios radicales en los hábitos de las personas (Owen, 2009, p. 38). Viviendo en proximidad nuestro estilo de vida es simplemente más sostenible. Pero si bien es verdad que el vector social y económico puede ayudar a promocionar la proximidad como un modelo de urbanización estratégico, la planificación espacial no puede por sí sola construir ciudades y actitudes sostenibles. En paralelo a la promoción de los entornos de proximidad se necesitan de medidas económicas, punitivas y restrictivas que castiguen los modelos urbanos y de movilidad más insostenibles (Næss, 2006b, p. 257). Estos paquetes de medidas deben ser impulsados por la administración pública y deben estar orientados a hacer más atractiva la movilidad sostenible por medio de penalizar la movilidad insostenible.

Poder público

Esta necesidad de medidas complementarias enlaza con la importancia de los poderes públicos en la promoción de movilidad y el desarrollo urbano sostenible. Tal y como explica Klein (2014) la dimensión de los retos a los que nos enfrentamos es tan grande que no le podemos pedir al mercado que solucione los problemas provocados por el actual modelo de urbanización. En su obra de referencia sobre la historia de la planificación urbana en el siglo XX *Cities of tomorrow*, Peter Hall (1988) expone como ante la crisis de postguerra, las ciudades europeas recurrieron al sector público para solventar los princi-

pales problemas urbanos como la escasez de vivienda e infraestructuras[34]. En los años 70 y 80 sin embargo, con la crisis de postguerra europea superada se optó por la iniciativa privada como principal motor y gestor de la ciudad, en una tradición que se extiende hasta nuestros días. El cambio significó dejar de planificar la ciudad como aquello que debía ser para quedarse en gestionar aquello que ya era (Goonewardena, 2012, p. 107), renunciando en gran medida al poder transformador de la planificación, y perpetuando el mantra posmoderno de la no intervención y el *laissez faire*.

Esta deriva liberal ha desmantelado el sector público y en la actualidad la creciente pérdida de poder de los consistorios en materia de urbanismo y su cada vez mayor dependencia respecto a la iniciativa privada dificulta la puesta en marcha de medidas estratégicas que son cada vez más necesarias. La crisis en la que nos hallamos nos enfrenta con la necesidad, de cambiar nuestros valores de consumo, comportamiento y gestión de la ciudad y su solución no pasa solo por cambiar aspectos cosméticos mediante las *smart-cities* (Townsend, 2013, p. 286) o por una vaga esperanza en una nueva revolución tecnológica (Moore, Staley, & Poole Jr., 2010). Si el objetivo es la construcción de ciudades realmente sostenibles se necesita de poderes públicos fuertes para impulsar la urbanización compacta y penalizar los modelos insostenibles (Graham-Rowe et al., 2011).

Aplicando el principio de proximidad

Al buscar soluciones espaciales a los problemas de movilidad siempre tenemos que tener en cuenta dos factores esenciales: la inercia de la forma urbana y la especificidad de cada ciudad. Por un lado mientras que las formas arquitectónicas fluctúan y cambian rápidamente, la estructura de la ciudad -su forma- es el producto de años de acumulación de tradición y planeamiento. La forma de la ciudad tiene una inercia larga, imposible de cambiar de un día para otro. Por otro lado, cada ciudad tiene unas características distintas que hacen que no exista una solución buena para todas. La políticas basadas en el *copy paste* de ideas exitosas en otros ámbitos raramente funcionan. Cada ciudad necesita su propia gama de medidas y soluciones, diseñadas específicamente para sus características.

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[34] Entre 1945 y 1975 el 65% de las viviendas construidas en Suecia fueron de promoción pública, construyendo casi 2 millones de hogares bajo una visión pública, controlada y planificada de la ciudad (Hall, 1988, p. 364)

Es por eso que funcionan mejor los principios básicos como la proximidad, la densidad o la diversidad, que pueden ser aplicados en distintos ámbitos de la ciudad y en distintos momentos del desarrollo urbano, que las formas de diseño cerrado como los ensanches, la ciudad lineal, los cinturones verdes o incluso el *Transit Oriented Development* (Lynch, 1984). Es por esa misma razón, que en esta tesis hemos evitado hablar de centralidad-periferia o zonas específicas de las ciudades. La proximidad se prescribe aquí como receta general para todo tipo de desarrollos urbanos, que no deben circunscribirse a áreas concretas de la ciudad, sino que por el contrario es la homogeneidad de entornos densos y compactos lo que multiplica el potencial de la proximidad. En ese sentido, algunas de las llamadas periferias de Barcelona desarrollan modelos de movilidad más sostenibles que el centro, pero en general, son los niveles uniformemente altos de densidad a lo largo de toda la ciudad, lo que permite la movilidad de proximidad.

Igualmente, la introducción de la variable proximidad en el planeamiento urbano no debe asociarse con la mejora y rehabilitación de algunas zonas seleccionadas. Las políticas urbanas excesivamente focalizadas en fragmentos de la ciudad –el centro, el barrio tecnológico, el casco histórico- son una de las políticas neoliberales más dañinas para nuestra ciudad actual (Goonewardena et al., 2008, p. 143). La prescripción de proximidad que aquí se propone es pues un principio general a aplicar al conjunto de la trama urbana, y no como una herramienta más puesta al servicio de la revalorización de piezas urbanas privilegiadas. Existen ya algunas iniciativas de planeamiento urbano –el caso de Portland, EUA o Melbourne, Australia- que son pioneras en introducir el tiempo de viaje hasta los servicios básicos como variable fundamental del planeamiento (Stanley & Stanley, 2014). Nacen así conceptos como la *minute city* o los complete *neighbourhoods* que sirven para designar nuevas formas de planeamiento que miden su éxito no en la consecución de objetivos físicos –densidad, mixticidad- sino en la consecución de objetivos relacionados con la movilidad: que todos los habitantes puedan llegar a los servicios básicos en un viaje de 20 minutos (Stanley, 2014).

Problemáticas asociadas

En un sentido crítico, no podemos pensar en la proximidad como la solución a todos nuestros problemas. Como ya se apuntaba en la introducción, no existen soluciones sencillas a los problemas complejos. También parece evidente que implantar un modelo urbano basado en la compactación y la proximidad no solo no solucionara todos los pro-

blemas sino que también generara nuevos desafíos, y es que tal y como predica la 4ª ley de Commoner: *there is no such thing as free lunch*. Cualquier cambio que implantemos en la trama urbana tendrá tanto consecuencias esperadas como inesperadas. Aún sabiendo eso, y tal y como apuntan Brenda y Robert Vale (2010, p. 19), la necesidad de aumentar la sostenibilidad de nuestras ciudades debe movernos inequívocamente hacia la forma urbana que promueve comportamientos y dinámicas más sostenibles.

Entre las opiniones contrarias a la ciudad compacta y a la proximidad, una de las críticas más recurrentes tiene que ver con la *gentrificación*, el aumento de rentas urbanas y la competencia por el espacio. El argumento tradicional es que en los entornos de ciudad compacta, la competencia por el espacio es más alta y por tanto se intensifica la segregación por motivo de renta en aquellas áreas mejor situadas o con mejor oferta de servicios (Williams et al., 1996, p. 92). El proceso de compactar la ciudad, además, implica un retorno de las clases medias y adineradas desde su exilio periférico a los espacios de centralidad generando un desplazamiento de la población de rentas bajas hacia los espacios de menos calidad de la ciudad (Brenner, Marcuse, & Mayer, 2012, p. 181).

En mi opinión sin embargo, no debemos asociar tan fácilmente proximidad con gentrificación. En primer lugar porque el problema de fondo de la gentrificación no es la estructura espacial sino la pobreza urbana. Tal y como indica Glaeser (2011, p. 201), los efectos de la proximidad hacen que vivir en ciudades sea atractivo, y esto atrae población pobre, pero el problema no es la ciudad, ni la proximidad, sino la pobreza. El argumento además tiene algo de falacia, puesto que asocia proximidad con un aumento de las dinámicas de expulsión por motivo de renta, dando a entender que sin proximidad no existen esas dinámicas. La segregación de población por motivo de renta y el clustering de grupos sociales en determinados espacios de la trama urbana es un elemento natural de la propia ciudad que no se produce sólo en términos de renta, sino que responde también a aspectos culturales, de etnia o religiosos (Tonkiss, 2013, p. 85). Además, al eliminar la desigualdad por motivo de transporte en el acceso a los servicios básicos de la cotidianidad, se atenúa uno de los elementos básicos de la desigualdad en la ciudad: la diferencia de accesibilidad.

Derecho a la proximidad, derecho a la ciudad

Pero volviendo a la movilidad de proximidad, no debemos olvidar que existen otras motivaciones más allá de la sostenibilidad que también actúan como factores a favor de la movilidad de proximidad. La movilidad se halla en el corazón de la vida moderna. Vivimos en una sociedad hipermóvil que exige a quien quiera participar de ella una elevada capacidad de movilidad (Camarero & Oliva, 2008). En muchas ciudades la movilidad es ya una de los principales factores de desigualdad (McGuirk, 2014, p. 161) puesto que la movilidad ya no se concibe solo como la capacidad de desplazarse desde A hasta B, sino como la habilidad de participar activamente de las posibilidades de la sociedad urbana. Numerosos autores hablan ya de el derecho a la movilidad (European Commission, 2010) y el derecho a la accesibilidad (Gehl, 2010) como una parte necesaria del derecho a la ciudad de Lefebvre.

Pero como se relaciona este derecho a la movilidad con la proximidad? Y como se entiende que hagamos un alegato a favor de la movilidad a pié, cuando el dinamismo del coche nos otorga una libertad de movilidad sin precedentes? Hemos destacado en estas conclusiones dos elementos necesarios para avanzar hacia la movilidad de proximidad y sostenible: cambiar la estructura espacial de la ciudad y aumentar el poder de intervención de las instituciones públicas. Existe sin embargo un tercer elemento importante y que es, si cabe, aún más complicado de conseguir. Este tercer elemento consiste en contrarrestar el vínculo libertad-automóvil que 50 años de propaganda y cultura automovilística han creado. Este vínculo forma parte de una de las estructuras ideológicas más potentes del mundo moderno, y consiste en conceptualizar el automóvil como un artefacto que multiplica las posibilidades de la vida diaria (Freudendal-Pedersen, 2009, p. 71). Esta construcción ideológica se sustenta en el supuesto que el automóvil nos proporciona una mayor movilidad y que eso conlleva una mayor felicidad. Los estudios de Montgomery (2014) y Kaufmann (2008) sin embargo niegan esta asociación al demostrar que ni los individuos con coche son los individuos con mayor capacidad móvil, ni los individuos más móviles son los individuos más felices. Se trata por tanto de una creencia enraizada en la sociedad que se sustenta principalmente en imágenes románticas de velocidad, espacio, carretera, mercadotecnia (BMW- "Te gusta conducir?") estatus y aspiraciones sociales (Steg, 2005). Y se sustenta también por un miedo a la inmovilidad que se deriva también del entorno urbano construido en base al coche. El miedo a no poder llegar al hospital a tiempo en un momento de emergencia, de no poder aceptar una eventual oferta de

empleo por no poder acceder al puesto de trabajo. Este miedo a quedar excluidos de la sociedad hipermóvil nos lleva a utilizar el coche, mientras que el hecho que la mayor parte de la sociedad tenga coche alimenta el diseño urbano y de infraestructuras en base a las necesidades del coche. Contrarrestar estas dos dinámicas que se retroalimentan y que a la vez son avivadas por políticas públicas y sectores económicos cómodamente adaptados a los mecanismos de la sociedad dependiente del automóvil supone un reto mayúsculo para la proximidad.

Que puede ofrecer la movilidad de proximidad en relación con la idea de libertad asociada al movimiento? En primer lugar ofrece un modelo de movilidad socialmente justo y equitativo. Tal y como describe Freudendal-Pedersen (2009, p. 81), la libertad que otorga el coche tiene un coste muy alto, ya que solo se convierte en realidad cuando se niega la libertad a otros. La libertad del conductor se construye a partir de la negación de libertad del no conductor. La ciudad de proximidad no distingue por motivo de acceso a un sistema de transporte motorizado sino que introduce una movilidad básica –a pié- universalmente accesible. En segundo lugar, debemos desafiar la propia naturaleza del vínculo entre coche y libertad. Cuando como sociedad nos hemos alejado de la proximidad hemos necesitado compensar la flexibilidad que suponía vivir cerca de destinaciones y posibilidades mediante un aumento de la movilidad gracias al automóvil. Pero en cuanto nuestro estilo de vida urbano ha colonizado por completo las posibilidades del nuevo espacio de actividad que proporciona el coche, el uso del automóvil ya no es una opción generadora de libertad, sino una obligación propia de la falta de libertad. Si para Yi Fu Tuan (1977, p. 54) "el sentido básico de la libertad es poder moverse", entonces el coche ya no nos hace libres, sino que nos hace dependientes. En ese contexto el retorno a la proximidad supone una liberación de la tiranía de la distancia y la velocidad. La proximidad se revaloriza en el s.XXI porque hemos probado el sueño de la ciudad en la distancia y hemos comprobado que no solo no nos acerca a la felicidad que los anuncios de automóvil nos prometían, sino que nos ha generado nuevos problemas y obligaciones.

La proximidad nos ofrece ahora un nuevo sueño, el de poder participar plenamente de nuestra ciudad sin diferencias de acceso, mediante modos de transporte sostenibles y sin tener la obligación de tener que desplazarse en automóvil. Es el viejo sueño Lefebvriano del derecho a la ciudad, derecho a la movilidad, derecho universal de poder participar de la sociedad. La tesis que aquí se cierra pretende ser un grano de arena hacia la consecución de este sueño, al demostrar que la movilidad de proximidad no es una

utopía, es un modelo de movilidad viable, y que la solución lleva estando mucho tiempo delante de nuestros ojos, solo que estábamos demasiado preocupados gestionando la velocidad y las distancias para poder verla.

PARTE VI

Referencias y Anexo

CAPÍTULO 10

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Anexo

Cities 42 (2015) 258–266

Contents lists available at ScienceDirect

Cities

journal homepage: www.elsevier.com/locate/cities

The Walkable city and the importance of the proximity environments for Barcelona's everyday mobility

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ARTICLE INFO

Article history:
Received 30 June 2014
Received in revised form 10 September 2014
Accepted 27 October 2014
Available online 18 November 2014

Keywords:
Proximity
Everyday mobility
Pedestrians
Neighborhood
Walkability

ABSTRACT

To evaluate the importance of walkable environments and neighborhood's vitality in people's everyday life, this paper analyzes proximity travel in Barcelona. Data were taken from one of the major mobility surveys in Spain, which offers the depth required to identify short walking journeys that take place within the neighborhood scale. By analyzing people's mobility patterns, we get a more accurate approach to proximity and inner-neighborhood dynamics. The analysis focuses on the frequency and purpose of these short walking trips, along with the urban settings that foster them. The study also evaluates how proximity trips are unequally distributed throughout the city and how income and population density levels can effectively promote this kind of traveling behavior.

Introduction

Urban proximity has been a predominant theme in the contemporary urban discourses in recent years. Within the complexity of trying to define a more sustainable urban form, and also in the context of the "mobilities turn", the distance traveled to access urban uses and services has been found to be a key factor. Proximity dynamics have a wide array of positive outcomes from vehicle emissions to energetic consumption or the wellbeing of citizens (de Nazelle, Morton, Jerrett, & Crawford-Brown, 2010; OECD, 2012).

Despite this positive assessment of compactness and small-scale dynamics, few academic studies have addressed proximity from the people's perspective. To address this gap, this study explores how citizens of a compact Mediterranean city like Barcelona are using their most-near urban scale, and it does so through the analysis of their daily mobility, bringing a more accurate approach to this proximity dynamics.

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http://dx.doi.org/10.1016/j.cities.2014.10.012
0264-2751/

Compact city and urban mobility

In recent years, the Walkable city along with the compact city concepts have gained wide acceptance among academics and urban planners as sustainable urban forms for the future, capable of dealing with negative externalities of both the urban and transport models (Dempsey & Jenks, 2010; Næss, 2005; Næss, 2013). The relationship between urban form and mobility has been analyzed through three main vectors: environmental issues, the social significance of walkability, and the use of time. Variables such as high densities, a public transport supply, and mixed-use development are usually found to be key elements for improving access to local services and to promote fairer transport models (Banister 2008; Banister & Hickman, 2006; Dempsey, Brown, & Bramley, 2012; OECD, 2012).

Environmental considerations have always been at the center of the debate (IPCC, 2007; Loo & Chow, 2006; Muñiz & García-López, 2013) ever since Newman and Kenworthy (1989) stated that the built environment could effectively modify fuel and energy consumption for mobility purposes. Empirical studies have attempted to define the exact effects of urban form on transportation behaviors and modal choice (TRB, 2005, 2009; Miralles-Guasch, Martinez Melo, & Marquet Sarda, 2014).

The recovery of the pedestrian as one of the main urban actors in the city's public space has been another of the most prolific lines of research and has been addressed from different scientific

disciplines (Alshalalfah & Shalaby, 2007). Under the new sustainability paradigm both walking and cycling for transport gain merits, as they are energy efficient and low pollutant, while also being the most democratic means of transport (Boer, Zheng, Overton, Ridgeway, & Cohen, 2007; Delbosc & Currie, 2011). Walking grants almost universal accessibility – understood as people's capacity to reach a certain place with an affordable effort (Ureta, 2008) – as everyone can be a pedestrian regardless of income, skill, gender or ethnicity (Hanson, 2010). On recent years some works on public health have also taken an interest in the compact urban forma as a generator of active mobility patterns that increase people's physical activity (Koohsari, Badland, & Giles-Corti, 2013; Sung, Go, & Choi, 2013).

Finally, some authors (Miralles-Guasch, 2008; Mückenberger, 2008; Robert, 1992) have explored the impact on travel times of increased distances between everyday activities. Within a limited time budget of 24 h, increasing some travel times requires a reduction in others. The paradox is that as the functional city expands in size there has been a parallel emergence (or resurgence) of small-scale dynamics (Méndez et al., 2009). For example, as individuals travel farther to a place of employment, they are likely to seek shorter travel times to complete other activities (everyday shopping, leisure) (Gimenez-Nadal & Sevilla-Sanz, 2011). This shorter travel time results in intensified use of neighborhoods (Timmermans et al., 2002).

Proximity and the compact urban form

The near location of the diverse urban functions – residence, work, leisure, commerce, services and equipments-intensifies the use of the neighborhood. According to Banister (2008) this increases people's accessibility and improves their living environment, as the aim of mobility is not just traveling from one place to another but also arriving to the right place at the right time, with affordable costs for anyone (Peters, Kloppenburg, & Wyatt, 2010). Urban studies and public policies are also rediscovering this urban scale and with it, the pioneering work of Jane Jacobs (1961) (Jensen 2009).

But how do we study proximity? Many investigators have approached it at the territorial level, using different methodologies to measure densities and built environments (Boyko & Cooper, 2011; Brownstone & Golob, 2009). They have tried to determine how dense the city must be to have a beneficial impact on transportation patterns, or how mixed the land uses must be to achieve the diversity needed to generate proximity travel (Cera, 2003; Ewing et al. 2011; Geurs & Van Wee, 2004). In most cases, they have analyzed existing urban settlements and attempted to estimate the effects that a particular change in those urban spaces would have on people's mobility.

While this territorial aspect of proximity is undeniable, we need to go beyond topological distance to incorporate more contextual aspects, such as travel time or the built environment where these mobilities take place (Brennan & Martin, 2012). Journeys and accessibility can be treated as a temporal attribute defined by travel times, as time is as inherent to proximity as space (Banister, 2011). In other words, proximity dynamics only appear in those places that gather both nearness between origins and destinations with affordable forms of accessibility for the local population. Because of that, proximity must be understood as a combination of specific spatial and temporal attributes, a double condition that can be observed through mobility analysis.

Despite being long considered a desirable characteristic of future cities (Banister, 2011; Boyko & Cooper, 2011; Ewing, Rolf, & Don 2002; Kaido & Kwon, 2008; Kockelman, 1997; OECD 2012) urban proximity has seldom been defined or analyzed from the citizen's point of view. The present paper intends to fill this gap by taking a different route: the study of daily journeys to determine the uses that residents make of their most immediate neighborhood.

Time and space, the defining elements of proximity

One of the difficulties of analyzing proximity from the mobility point of view lies in the lack of a linear relationship between space and travel time due to the different speed of each type of transport (Rodrigue, Comtois, & Brian, 2006). Therefore, modal choice must also be considered, in addition to travel time. To do so it is necessary to establish a definition of the brief travels. Ryley (2008) identified them as those travels that took 10 min or less to be completed, but to also estimate the covered distance on that same trip modal choice must be taken into account. In this regard, the transport means that are more related to proximity are the non motorized ones, especially walking, due to its regular speed not faster than 4.5 km/h (Rietveld, 2000). The combination of brief trips with slow speeds results in a journey that is certainly located in the neighborhood scale of the city (Fig. 1).

Methodology

Proximity analysis based on mobility patterns requires several sequential stages. We first studied how brief trips (taking no more than 10 min) are used in the city, setting out a general view of activities for which people tend to use very little travel time. Next, we focused on brief trips involving not only little time, but also being made by walking which entails covering short distances. These are the trips that have been defined as proximity trips and once they are isolated, it is possible to examine their frequency, the purposes they serve, and how they are distributed across the city. Finally, the study changes its scale to the neighborhood level, comparing the spatial distribution of proximity trips and searching potential explanatory factors.

Description of Barcelona

The area studied was the city of Barcelona, capital of the Autonomous Community of Catalonia (northeast Spain). In 2006, 1.6 million inhabitants were distributed across 10 administrative districts and 73 "*barris*", or small neighborhoods (IDESCAT). Nearly 90% of the city's 102.2 sq km had been urbanized by 2005 and its population density has not significantly changed over the last years (Martori Cañas, 2010). Busquets (2004) described the city's morphological characteristics as dominated by a continuous, compact urban area with buildings generally not exceeding 8 or 9 floors and mixed land uses, including a commercial structure marked by small retail business. Average family income was about 17,900 Euros in 2006 with some significant differences on its distribution. Another characteristic of the compact city that is met in Barcelona is a wide-ranging system of public transport: metro, train, tram, and bus lines.

Finally, the optimal design of street patterns, which is also a significant aspect for active transport and sustainable development, is clearly fulfilled by Cerda's *Eixample*, an urban planning development with a worldwide reputation (Dura-Guimera 2003; Pallares-Barbera, Badia, & Duch 2011).

Main data sources

The main data source was the Everyday Mobility Inquiry, a wide-ranging mobility survey taken in 2006 (hereafter EMQ06) as a joint initiative of the Department of Territorial Policy and Public Works of the Generalitat of Catalonia and the Metropolitan Transport Authority of Barcelona (Autoritat de Transport

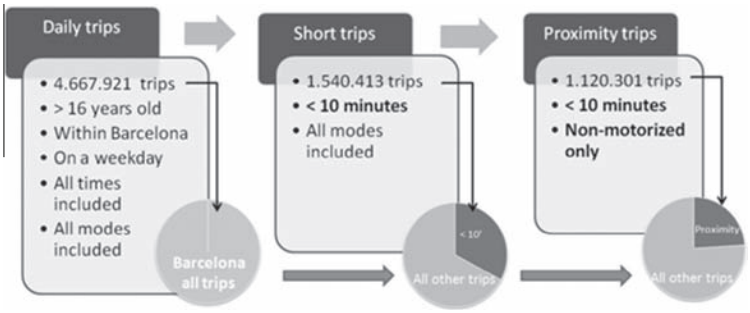

Fig. 1. Theoretical framework, from all trips to proximity trips. *Source:* Own production.

Metropolità, 2006). The aim of this survey was to describe the mobility of the resident population of Catalonia. As in most international surveys, it identifies "one trip" as one motivation to move.

The EMQ06 set the entire Autonomous Community of Catalonia as its territorial scope and performed 106,091 computer-assisted telephone interviews (CATI). The EMQ data are segmented into 856 transport zones for the whole of the Catalan territory. Although there is usually one zone per municipality, Barcelona contains 63 transport zones because of its size. Similarly, 24,000 (22.6%) of the interviews were done in Barcelona, permitting in-depth analysis and avoiding the treatment of Barcelona as a monolithic entity.

The EMQ06 provides information on the journeys, its territorial distribution and some socioeconomic characteristics of the people who make them. Mobility information includes modal choice, time spent on journeys, and degree of access to the different transport modes. Territorial characteristics include transport zone and total population. Finally, socioeconomic questions include gender, age, and professional situation.

EMQ06 also provides information about the motivations for each trip. This makes it possible to differentiate occupational mobility (travel to work or study) from personal mobility related to shopping, medical appointments, visiting or accompanying someone, personal business, leisure activities, or just taking a walk.

Data analysis was limited to travel by people older than 16 years of age, with an origin or destination inside Barcelona, and occurring from Monday to Friday (excluding holidays). The confidence level was set at 95.5% with a relative error of ±0.67%.

To effectively relate mobility analysis to urban and socioeconomic characteristics, we incorporated some of the vast information gathered by the official statistical service of the City of Barcelona. The two main variables drawn from this data source were population density of each neighborhood and average family income for by the year 2006.

Analytical scales

Two scales of analysis were used: municipal and a sub local one similar to the neighborhood level. The first is useful to get an overview of near-scale dynamics in Barcelona. The second one offers the most suitable dimension to study proximity and explore explanative aspects of neighborhood dynamics.

At municipal scale, we measured how many close-scale trips Barcelona residents reported taking, analyzing the time-length of brief trips as a precursor to deeper analysis of the proximity trips. At the neighborhood level, we delved more into these mobility patterns to see how they were related to specific urban characteristics.

To downscale the municipal analysis to the neighborhood level, we designed 15 study areas (Fig. 2). The overall criterion for constructing study areas was to group together the most similar urban areas, making it possible to more accurately assess the weight of each explanatory factor in the intensity of neighborhood dynamics. We carefully ensured that each study area was clearly defined, provided an appropriate sample size, had similar population density and income levels, and was large enough to produce statistically significant results using the EMQ06 data and municipal statistics. Socioeconomic variables were included to allow more in-depth analysis of proximity dynamics.

Results

Quantifying short trips in Barcelona: who, how, where, why?

Mobility data for Barcelona showed that residents older than 16 years make 4,667,921 trips per day which make for 90% of the total trips made in the city on a weekday. On average, each resident took 3.3 trips per day, investing 79 min in transportation. Trips were usually taken either by non-motorized means (45%, mainly walking) or by public transport (32%). Privately owned vehicles were used for 23% of trips. If the purpose of the trip is considered, personal mobility was the purpose of 60% of these trips; the rest were related to occupational mobility.

In terms of time traveled, slightly more than a third of all trips (1.5 million journeys) took less than 10 min, making the brief trip the most frequent kind of travel. Nearly half of these were completed within only 5 min. The modal split of these brief trips differed from the city as a whole: non-motorized means (76%) is followed by use of a private vehicle (17%) and public transport (7%).

Where do those brief, close-scale trips take Barcelona residents, and why do they go there? Overall, 43% of the personal mobility takes place inside this brief times parameters compared to 26% of occupational mobility. Fig. 3 shows how people allocate their travel times differently depending on the purpose of the trip. Personal purposes are more frequent in brief journeys (1–5 min and 5–10 min). In the case of trips between 11 and 15 min the distribution is nearly even between occupational and professional purposes. Finally, occupational mobility dominates in trips exceeding 15 min.

From time traveled to distance traveled

Time is only one of the variables that define a trip, as they can also be explained through covered distance. Thus, travel speed always plays a major role and with it the means of transport utilized as each mean of transport provides with different travel speeds inside the city. The distance traveled on trips that take the same amount of time will differ significantly depending on what mode of transport was used. In a 10-min trip, a pedestrian can walk 650 m, the equivalent of 6 streets in Barcelona's *Eixample*. It is this covered distance what links brief trips (up to 10 min) made by walking (with an associated speed of 4 km/h) with

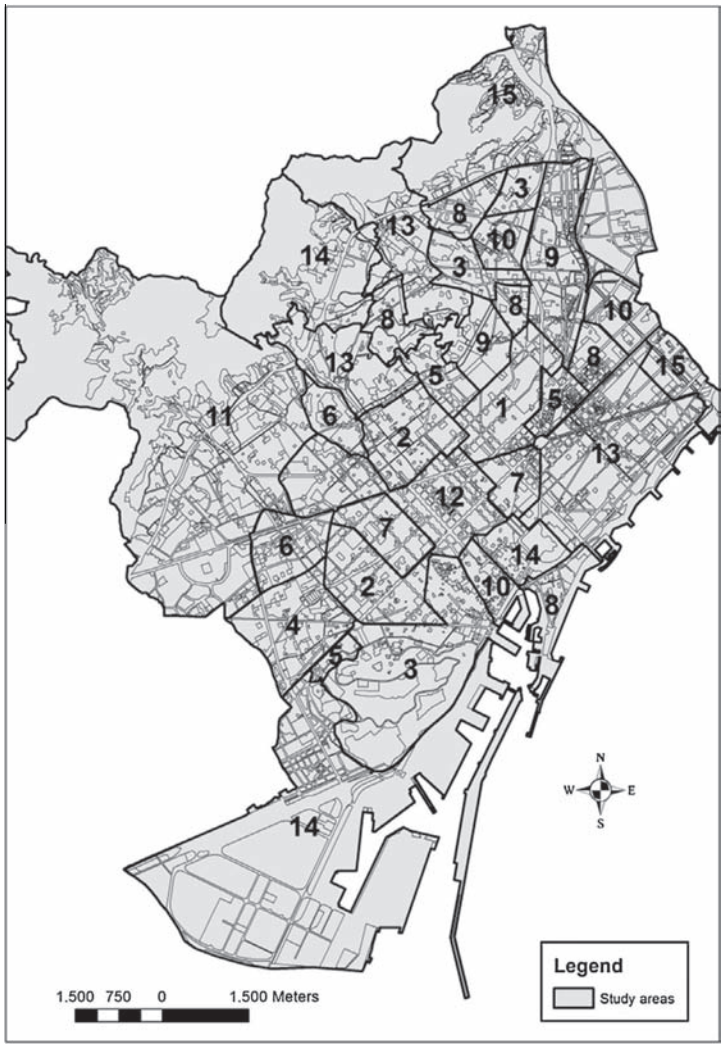

Fig. 2. Map of study areas. *Source:* Own production.

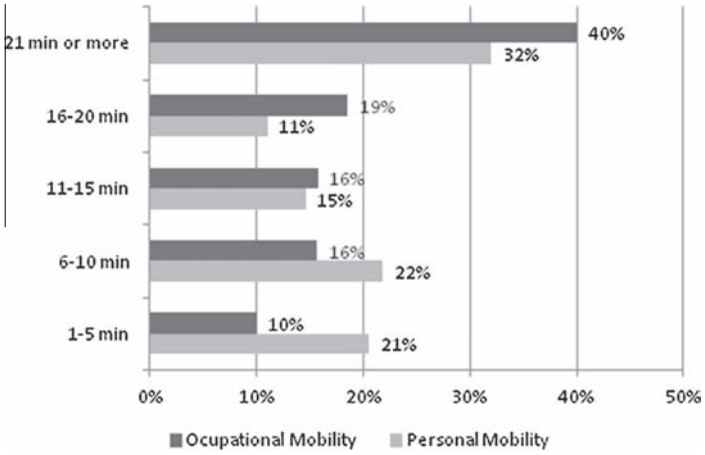

Fig. 3. Breakdown of travel time allocation depending on mobility types. *Source:* Own production based on EMQ06 data.

proximity dynamics. Other speeds would stand for greater covered distances that could certainly not be included into these dynamics.

The data indicated 1.1 million of these proximity trips in Barcelona (24% of all travel) were made in a single day. More than half of them took no more than 5 min of travel, representing an even smaller area of activity. These brief walking trips represent nearly one quarter of all daily mobility; an evidence of local dynamics that is indicative of how Barcelona has preserved a high degree of neighborhood vitality.

An important aspect of this within-neighborhood mobility is the motivations for these journeys. Fig. 4 shows the frequency of proximity trips stratified by type of activity. At the local scale, the most frequent activity is shopping, followed by accompanying others: 55% and 38%, respectively, of all such trips in Barcelona are proximity trips. On the other end of the spectrum, only 11% of trips to work meet the conditions of proximity travel.

This data indicates that proximity is more related with personal activities than professional ones and strongly links neighborhood utilization with the personal and domestic realm. The lower use of proximity travel for occupational purposes may reflect some disconnection between the residential and employment spheres (Miralles-Guasch, 2011; Miralles-Guasch & Domene, 2010; Poli, 2009), however, it is also noteworthy that Barcelona has managed to maintain such a large proportion of the labor mobility inside this local scale.

For a deeper analysis of proximity utilization, and given that local scale comprises very short distances, it is necessary to change the scale of analysis from the municipal to the neighborhood level to explain the localization of these dynamics and their relationship with their specific urban environment.

Proximity by areas of study

The scale provided by the 15 study areas (designed to accommodate trips completed by walking 20 min or less) made it possible to analyze the spatial distribution of local dynamics. By definition, it also permits the study of proximity trips in their most appropriate territory, as their field of action is equivalent to a 10-min walk. At the same time, this change of scale enabled comparative analysis between study areas, making it possible to spot some key factors for the presence of close-scale urban dynamics.

Fig. 5 shows the distribution of the proximity trips for each area. The most remarkable characteristic is the consistency of neighborhood uses throughout the city: 11 of the 15 study areas were very close to the city-wide average of 24% of trips made within the local scale, with proximity travel ranging from 22% and 27% of total trips.

This steady use of the local scale can be attributed to the general homogeneity of the city's morphological features. As reported in the municipal data analyzed, public and private services are well distributed throughout Barcelona, averaging 3 schools and 1 primary health care center per square kilometer. The city's retail structure is characterized by medium- and small-sized businesses, and 40 covered markets are distributed across the city. All in all, commercial uses occupy 16% of the city's surface area. This distribution of services is combined with very high population density in most of Barcelona: 87% of the population lives in urban environments of more than 15,000 inh/sq km.

Beyond the similarities observed, analysis of areas with extreme values showing significantly different uses of the neighborhood can provide interesting insights. Of the four areas with remarkable differences in local-scale uses, two had values higher than the city average and two had lower values. In the two areas where proximity travel was most used (#10 and #3), these trips constituted 30.4% and 28.5% of total journeys, respectively. In contrast, proximity travel in areas 11 and 13 accounted for 19% and 22% of trips, respectively.

Areas 10 and 3 comprise the historical core of the city, along with a much more diverse building typology in areas of mixed development that were mainly urbanized in 1960–1970. They are neither peripheral nor exclusively centric areas, and are defined by high densities and buildings almost never surpassing 8 or 9 floors. These areas concentrate both a high proportion of the aging population, with 23% of the population older than 65 years and more than 40% foreign-born in the 2006 municipal statistics.

In contrast, areas 11 and 13 are indeed located on the municipal periphery. These are the most dispersed areas of the city, urbanized more recently (more than 15% of the urban tissue is post-1980 construction). Finally, they are inhabited by adult (30–64 years old) and young (16–29) population with a higher average income.

It is also noteworthy how Ildefons Cerda's Eixample, which is Barcelona's most emblematic urban structure, shows consistent and regular local-scale uses. Its regular grid of vertical and horizontal streets occupies the geographical center of the city. Its gross density is constantly above 30,000 inh/sq km. Most importantly, the neighborhood dynamics always generate a proximity travel ratio close to the city's 24% average.

Explanatory factors

To explain differences in proximity uses, the literature has generally identified the built environment and residents' sociological conditions as the key determinants of urban mobility choices. Among the many variables used to test this relationship, the most

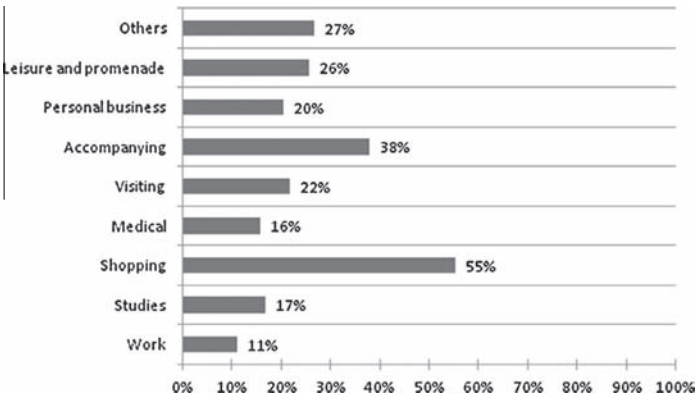

Fig. 4. Breakdown of proximity trips by travel purpose. *Source:* Own production from EMQ06 data.

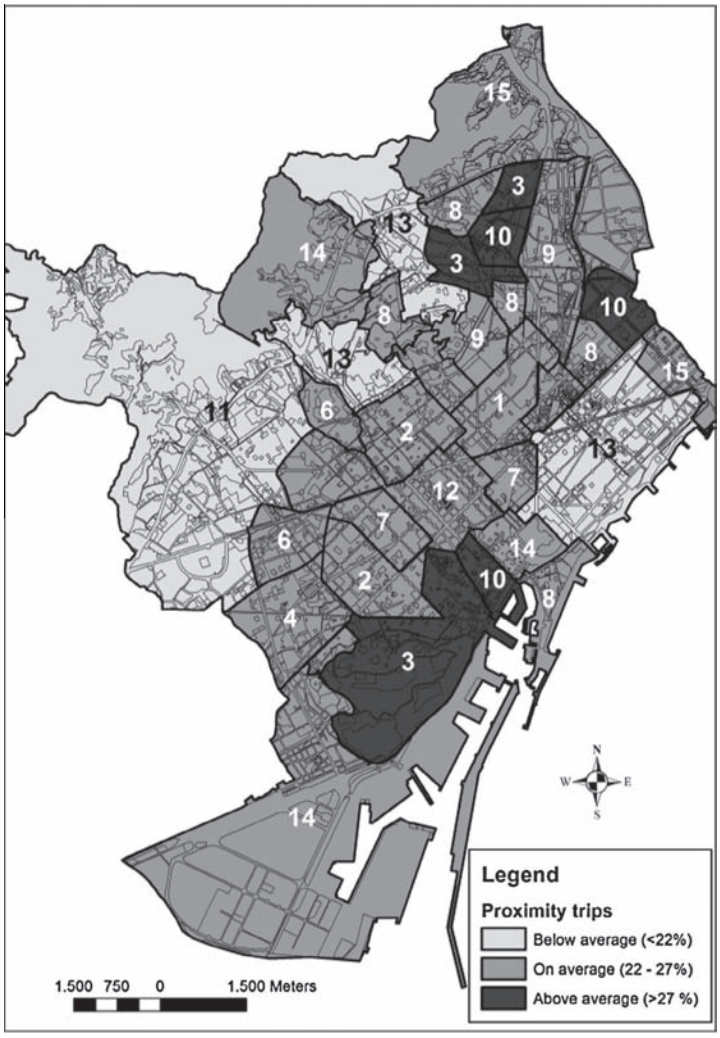

Fig. 5. Frequency of proximity trips in Barcelona. *Source:* Own production from EMQ06 data.

commonly analyzed include population density (Greenwald & Boarnet, 2001; Rodrigue et al., 2006; Litman & Steele, 2009) and income per capita (Brownstone & Golob, 2009; Frank & Pivo, 1995; García-Palomares, 2010). Therefore, we chose to test the relationship of gross population density and income levels to mobility patterns, and specifically to proximity trips (Fig. 6 left).

Density serves as a proxy of the urban environment (Boyko & Cooper, 2011). In European types of city like Barcelona high density indicates a high concentration of population in a given area, which can lead to an assumption that there is also a high offering of services and retail shops. Furthermore, as a measure of concentration, density is also valuable in distinguishing between compact and disperse urban tissues. In diverse urban environments, density identifies areas with the potential to accommodate proximity dynamics.

Gross population density is displayed in Fig. 6. A SW–NE swathe crosses the city with constant high densities with 11 out of 15 areas have density levels above 20,000 inh/sq km. Low density is observed only at the periphery. This homogeneous context of built environment decreases the value of density as an explanatory factor for proximity dynamics.

Nonetheless, although its role may be small, density has some impact on neighborhood utilization in Barcelona as it can be seen in Fig. 7. First, we can observe that denser areas are more prone to develop local dynamics. Areas with more than 35,000 inh/sq km tend to have more proximity trips (24.8%) than areas with fewer than 20,000 inh/sq km (22.2%). As density increases from the more dispersed areas to the more dense ones, so does the use of the neighborhood. However, once a certain density threshold is surpassed, proximity utilization no longer varies significantly. For areas above the 35.000 inh/sq km, density ceases to be found as significant for proximity use. In areas with already enough critical mass of people and services, increasing density will no longer cause a major use of the local scale.

In conclusion, density acts both as a precondition and a facilitator of proximity uses; however, in highly homogeneous environments it cannot provide the sole explanation for the intensity of local-scale uses. There are other important factors, some of which may still be related to the built environment. One of them may be the number of services and facilities available to the residents of a certain area. In this sense, areas 11 and 13 have densities similar to areas 14 or 15, but while commerce represents 42% of the cadastral

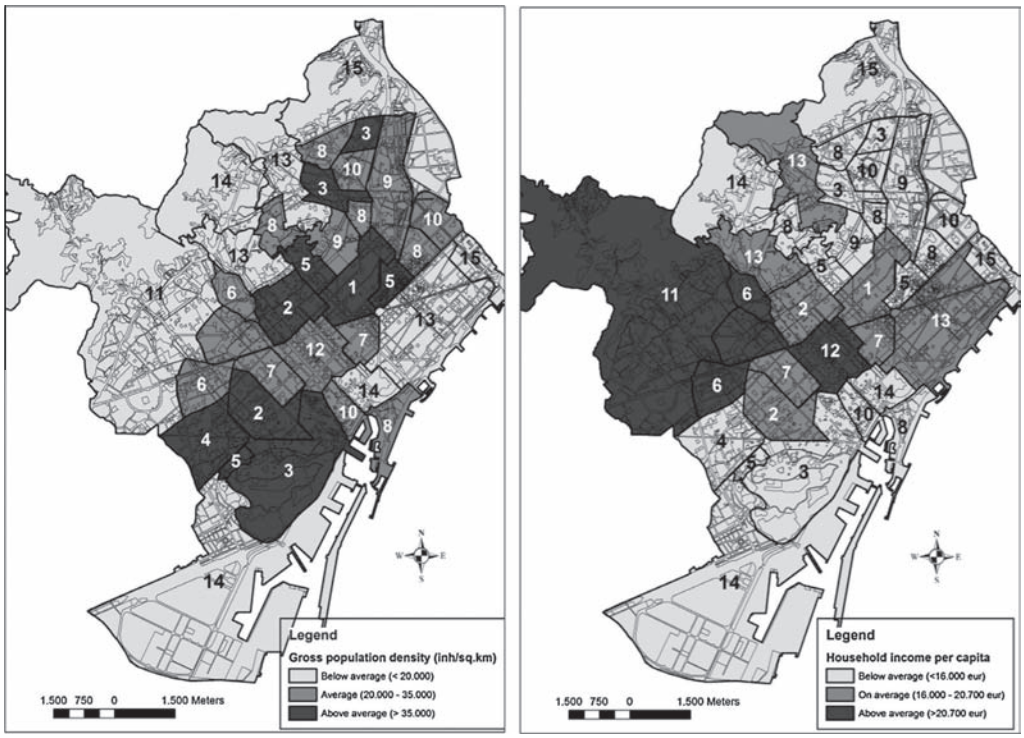

Fig. 6. Density and income distribution in Barcelona. *Source:* Own production from Barcelona Statistical Service data.

	Use of proximity trips (%)		
	Yes (*>10' walking trips*) (%)	No *(other types of trips)* (%)	*Total (%)*
Density (Pearson Chi-Square = 64895)			
Below Average (<20.000)	22.2*	77.8**	100
Average (20.001 – 35.000)	25.4**	74.6*	100
Above Average (>35.000)	24.8	75.2	100
Income (Pearson Chi-Square = 74774)			
Below Average (<16000)	25.8**	74.2*	100
Average (16.000 - 20.700)	22.9*	77.1**	100
Above Average (>27.000)	23.4*	76.6	100
Total	24.3	75.7	*100*

Source: own elaboration from EMQ06
Test: Chi² sig=000 all categories; Adjusted residuals test, corrected.
** significantly higher values
* significantly lower values

Fig. 7. Use of proximity trips upon population density and income. *Source:* Own production from EMQ06 and Barcelona Statistical Service data.

surface for the first pair of zones, for the second ones this figure is 34%. A wider range of near destinations available contributes to areas 11 and 13 having more proximity trips.

The second main variable tested was family income per capita (Fig. 6 right). The spatial distribution of income levels is more differentiated than population density and it follows a very clear pattern. The average income in Barcelona is approximately 17,900 Euros per year. In urban areas on the west side of the city, incomes are much higher (29,000 Euros/year); in areas of the city's historic core and some areas to the north, they are well below the average (11,200 Euros/year). Below average income is found to be significant for proximity utilization, as 25.8% of low income trips are made through a short walking trip. In contrast, this figure is higher in Average and Above Average areas which suggest a link between income and neighborhood utilization that is statistically confirmed in Fig. 7. Actually, income appears as the most relevant variable explaining variance in the use of the local scale in Barcelona ($\chi^2 = 74.774$ $p < 0.001$) slightly in front of density ($\chi^2 = 64.895$ $p < 0.001$).

More intense proximity uses in poorer areas appears to be related to access to privately owned vehicle. The close relationship between motorization and income (Scheiner, 2010) is reflected in

25% higher rates of car ownership in richer areas than poorer ones. In the poorer areas, having no car makes it impossible to undertake long trips in an acceptable time range; this increases usage of the local scale. Additionally, fewer cars per capita increases general utilization of non-motorized travel, which constitutes part of the definition of proximity travel.

Summary and conclusions

Most of the new urban discourses understand that proximity between different functions of the city creates mobility models that are more sustainable and democratic. But proximity is not only defined as a Euclidian or topological distance but also on people's capacity to travel from one point to another in an affordable time and mean of transport (Brennan & Martin, 2012). Proximity, therefore, encompasses both time invested in travel and distance covered on the trip. While the definition of brief trips allows examination of the temporal aspect, proximity trips provide the complete temporal and spatial picture. In turn, as proximity trips relate to very short distances, they are useful to examine the everyday functioning of the neighborhood as part of the compact city.

Analyzing proximity trips requires a two-scale analysis, combining the study of aggregated data at the municipal level and a detailed scope at the neighborhood level. This dual analysis of mobility data extracted from the EMQ06 enabled both a big-picture perspective on the use of the local scale and the study of proximity at its most appropriate level: the neighborhood.

At the speed of the pedestrian, we can impute a distance traveled to every walking trip, and therefore define proximity trips as those made by non-motorized trips and taking 10 min or less. Such trips are very frequent in Barcelona's daily mobility, representing one quarter of all the trips taken in the city on a weekday (2006 data). The most remarkable aspect of the way people use these trips is that they are intimately related with personal mobility: 80% of all proximity trips have a personal purpose. It means that although citizens tend to report longer travel times for work-related trips, personal needs are being met inside the neighborhood scale. Despite this finding, Barcelona's compactness has helped to retain a remarkable number of jobs inside the proximity sphere.

Such intense proximity dynamics are only possible thanks to the morphological characteristics of Barcelona, defined by mixed land uses, homogeneous high-density developments, and a planning tradition focused on well-distributed services and facilities (Busquets, 2004). However, when we examined the distribution of proximity trips across the smaller study areas, we observed variations in the patterns and intensity of proximity uses. These variations are explained by a combination of density and income factors. In this specific analysis, the income factor was the major factor, as the relevance of density is diminished by the constants that characterize the built environment. Our results suggest that density is a necessary element for the existence of proximity dynamics, but beyond a certain level of density (20.000 inh/sq km) we observed that income and sociological factors gained importance in determining the intensity of local-scale uses. The income level affects every day mobility by determining access to private and public transport means. Thus, lower motorization of the poorer areas drives to localizing a greater amount of trips inside the neighborhood that is always reachable within a 10 min walking trip.

Overall, studying the proximity from the mobility point of view contributes to increase knowledge about a dynamic that involves a large variety of brief journeys covering short distances and that are used to a wide array of different motivations. This closer look to the proximity trips intends to understand a myriad of short trips that constitute the heartbeat of the city and that have still to be studied accordingly (Bissell, 2013).

Acknowledgments

The research reported in this paper has been possible thanks to financial support received from the Project CSO2010-18022 (subprogram GEOG). The territorial social and environmental perspective of investigations about mobility and transport. A geographic analysis). This research would not have been possible without the support received from the Metropolitan Transport Authority of Barcelona (ATM) at providing all the data required. Additionally, the authors would like to thank Elaine Lilly, Ph.D., of Writer's First Aid for English translation and revision.

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Transportation Research Part A 70 (2014) 210–222

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Walking short distances. The socioeconomic drivers for the use of proximity in everyday mobility in Barcelona

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ARTICLE INFO

Article history:
Received 11 February 2014
Received in revised form 18 September 2014
Accepted 13 October 2014

Keywords:
Proximity
Local travel
Walking
Barcelona

ABSTRACT

Many studies have found that cities, with residents that are co-located with jobs and services in compact and diverse urban environments, generate positive outputs for a number of areas of social policy, with issues ranging from environmental to social and including public health. This evidence supports promoting rich and thriving neighbourhoods in order to encourage short distance mobility. In this context, we use a wide travel survey (EMQ06), undertaken in Spain, to measure short-distance travelling within Barcelona and to assess how distinct social groups make use of the local scale for their everyday mobility. The effects of socioeconomics and access to transport are discussed, prior to applying a Chi-squared Automatic Interaction Detection (CHAID) method, in order to explore heterogeneity among the different social groups, in terms of local travelling. We found that nearly a quarter of all daily mobility in Barcelona is performed with a local trip, and that short trips are more frequently undertaken for personal purposes. Also, age, gender and access to private transport appear as significant factors. Overall, our results suggest that a proximity scale is being used by those groups with greater time–space constraints, such as working women or low income people without access to private vehicles, opening important implications on transport policy regarding the design of proximity-prone environments.

1. Introduction

Proximity is a spatial concept with a growing presence in most of the academic literature regarding cities and urban environments. New ways of understanding the city are arising around principles such as sustainability, liveable cities, knowledge economies or rethinking of urban values. Within this new academic debate, proximity appears as a transversal element in many of the arguments. Especially important is the tendency to consider it as a key to achieving increasingly sustainable urban models, in the environmental, social and economic senses. Proximity, in general, facilitates human interaction, economic efficiency and social cohesion (Huriot, 1998). More specifically, reducing distances between housing, jobs and services, makes it possible to reduce the kilometres travelled in motorised vehicles, in conjunction with an improvement in the accessibility for people's everyday mobility. As a result, in recent years, planning policies have, increasingly, focused on favouring shorter travel distances and active transportation, promoting localised and compact urban development (Manaugh and El-Geneidy, 2012). The literature has extensively explored walking as a modal choice (Middleton, 2009;

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http://dx.doi.org/10.1016/j.tra.2014.10.007
0965-8564/

Saelens and Handy, 2008), and also the use of short trips (Litman, 2012; Ory and Mokhtarian, 2009). There have been far less studies that have, specifically, explored the use of short walking trips, although some examples can be found in Rietveld (2000) and Ryley (2008). Our study endeavours to fill this research gap while, concomitantly, introducing some methodological novelties and assuming a new perspective: a short walking trip is not just a matter of travel choice, but a need that has been resolved in a short distance, by means of a highly sustainable type of journey.

Hence, the present paper sets with two major objectives: (1) to introduce a new measure for short-distance travel and local use, and (2) to understand the effects of socioeconomic factors and access to transport on people's activity spaces and their use of proximity. To do so, the rest of the paper is organised as follows: the next section reviews the concept of proximity, along with some of the literature that has explored the determinants of travelled distances. Section 2 discusses a new approach to proximity measuring, through modal choice and travel time. It also introduces some characteristics of the study area, along with data sources and methods of analysis. In Section 3, the empirical findings, based on modelling results, are presented and discussed. Concluding remarks are presented in the final section. The discussion will be based on Barcelona data, but the results are universal and the policy lessons are easily transferable to other dense and compact urban environments.

1.1. Proximity

Spatial proximity is a long-discussed aspect of urban science (Allen, 2000; Gubbini, 1997; Schmid et al., 2011). In being defined, simply, as how closely located are the physical elements of a city, it should not be conceived as a simple Euclidian measure (Bissell, 2013; Healey, 2004). Assessing proximity through geometric distance means seeing the city as an isotropic space, an abstract and theoretic concept, very far removed from the anisotropic character of actual urban spaces (Brunet, 2013). Urban space is not homogeneous, as locations and places with different gravitational forces draw more, or less, attention from the users of the city (Healey, 2004; Huriot and Perreur, 1998). At the same time, every individual has a different set of perceptions which shape his (her) own idea of the urban world by modifying the actual use that he (she) makes of the urban environment. As a result, neither Euclidean nor rectilinear distances serve any purpose in assessing people's use of proximity (Dumolard, 2011).

In defining proximity, more contextual factors such as shape, orientation, size or connectivity are also relevant (Brennan and Martin, 2012), just as the preferences and needs of the population are as important as the neighbourhood's built environment. The spatial use of the city is shaped by the combination of objective and subjective factors (Dumolard, 2011) and, consistent with Nussbaum's works (2003), proximity should, therefore, also be addressed from people's capabilities and not only from physical parameters.

What makes local travel desirable for urban planners is its benign environmental and social outputs (Manaugh and El-Geneidy, 2012). With respect to the environmental aspects, compact cities consume less energy and release less pollutants (Owen, 2009). At the same time, the promotion of non-motorised transportation alleviates congestion problems and has a positive impact on public health (Handy and Boarnet, 2002; Kerr et al., 2012). It is through this increased presence of active modes of transport that proximity also entails its main positive outputs on the social aspects. This modal shift from motorised to non-motorised creates more democratic urban spaces, that avoid monetary or skill discrimination and that, finally, are diminishing the social differences caused by diverse access to transport (El-Geneidy and Levinson, 2011; Rubulotta et al., 2012; Talavera-Garcia et al., 2014). The absence of specifically needed abilities, such as having a driving license or monetary costs makes non-motorised travel, almost, universally accessible (Curtis and Scheurer, 2010). Hence, by making all the facilities in the city equally available to all kinds of people, proximity has the capacity to produce equal and socially sustainable travelling patterns.

1.2. Determinants of distance travelled: socioeconomics, access to transport and built environment

Each social group has its own travel necessities that are unequal and are defined by their demographic and socioeconomic status (Cerin et al., 2007). These characteristics determine daily needs, for which people are willing to spend more or less time, depending on their personal schedule. Time is a finite resource that is equal for everyone, regardless of wealth or social status (Madanipour, 2007). Within time, we have to accommodate all of our daily activities (Harvey, 1991). Upon these frameworks, every individual makes his own complex balance between activities, transport needs, and time available, which is demonstrated by their travel behaviour (Miralles-Guasch, 2011).

However, the exact distance that a person can travel in order to fulfil his (her) needs is strongly determined by access to transport (Morency et al., 2011). Uneven access to the different modes of transport, clearly, affects travel behaviour and, ultimately, people's travelled distances (Carse et al., 2013; Kenyon, 2011). Having access to mechanised transport, either private or public, is a precondition for making long journeys in short time spans, compressing time–space and making more locations available, hence, it has a great impact on activity territorialisation, modal choice and travelled distances (Scheiner, 2010). Together, time availability, personal needs and access to transport shape individual space–time prisms (Ritsema van Eck et al., 2005; Van Acker et al., 2010), a classic time geography concept that depicts the set of all locations that can be, potentially, reached by an individual, given a starting location and its temporal constraints (Mercado and Páez, 2009).

Overall, every social group has its own range of needs and every need must be satisfied somewhere within its available time–space prism (Chapin, 1974; Neutens et al., 2007). But, as aforementioned, urban spaces are heterogeneous and every

neighbourhood offers a different number of opportunities. Built environment and urban structure determine travel behaviour in many well documented ways (Ewing and Cervero, 2010; Guo and Chen, 2007; Sallis et al., 2004), none of which are more important than defining the amount of destinations available within every individual space–time prism. The distance travelled by an individual in his everyday mobility shall be the product of overlapping the potential of his built environment with his available space–time prism. The result is his activity space, usually, referred to as potential path area (Justen et al., 2013), a concept created by Horton and Reynolds (1971) to define the geographical area containing all the urban locations with which the individual has direct contact, as the result of day-to-day activities (Manaugh and El-Geneidy, 2012).

The number of services, jobs and amenities inside this potential path area is determined by the built environment. In this sense, traditionally, the European city and, particularly with respect to the Mediterranean city, has been considered as the paradigm of the compact city, in sharing several of its defining features (Beatley, 2012; Rueda Palenzuela, 2002). Being a palimpsest of overlapping developments and sequential urban plans, the Mediterranean city is characterised by aggregated, dense and diverse urban tissue (Dura-Guimera, 2003), which in many cases has also preserved a high degree of social mixture (Musterd and Zoltán, 2013). Despite the recent suburbanisation and metastatic metropolisation that most European cities have suffered (Ascher, 1995; Gutiérrez and García-Palomares, 2007), the core city, frequently at the centre of dynamic metropolitan areas, still preserves most of its morphological characteristics, providing compact city-like conditions for urban mobility (García-Palomares, 2010). In this, particularly, rich and diverse built environment (Muñiz and García-López, 2013), it is to be expected that a large share of daily mobility can be achieved through proximity trips, as it is possible to reach essential services without having to use motorised transports, thus, avoiding long distances.

However, the fact that the urban environment provides the potential for proximity trips does not mean that every social group uses this local scale with the same frequency. Understanding which are the social factors that foster this specific kind of travel behaviour is a key stage, prior to designing adequate policy measures, in order to encourage proximity dynamics (De Witte et al., 2013; Manaugh and El-Geneidy, 2012; Røe, 2000). At the same time, exploring how different social groups make use of the local scale will permit identification of whether or not proximity relieves the burden on transport dependency as a well-documented social exclusion factor (Metz, 2013; Stanley et al., 2011).

2. Methodology

We use a two-step methodology, in which we first tested the individual importance of each determining factor upon proximity utilisation, and then used a Chi-Squared Automatic Interaction Detection (CHAID) decision tree model to analyse which factors were more important in explaining local travelling. In this methodology section, we explain how we have been able to identify the trips that are covering short distances and we introduce the particular characteristics of the study area. Later, some main details of the data sources along with the basis of the CHAID model are described.

The CHAID method is being, increasingly, used in transport related studies (Pitombo et al., 2011; Yang et al., 2013; Zhang et al., 2014) in order to understand group responses in relation to a dependent variable (criterion), according to a combination of variables (predictors) (Kim et al., 2011). In the present case, the CHAID method is, especially, useful to analyse the travel behaviour of different subpopulation groups, in relation with the amount of local travelling. The model is, especially, useful at capturing the complexity involved in travel behaviour issues (Zhang et al., 2014). At the same time, tree classification techniques such as CHAID have the advantage of providing simple and clear representation for relations which are, usually, multifaceted (Sullivan and van Zyl, 2008).

2.1. Short walking trips

In order to observe the actual use that citizens make of their closest local scale, proximity will be measured through the everyday mobility of the citizens of Barcelona. In attempting to avoid traditional approaches, based exclusively on physical distance, we will measure proximity through both travelling time and speed. As stated by Pulselli and Tiezzi (2009), time alone already expresses both distance and speed, but in order to include the importance of transport in urban life today, speed will also be used to define proximity trips.

Therefore, from the mobility point of view, we define a proximity trip by the following conditions:

1. It has to be of short duration (Time) → 10 min or less.
2. It has to cover a short distance (Distance) → 650 m or less.
3. It has to be accessible (Transport) → Accessible by walking.

Whereas the first two conditions are somehow obvious, incorporating the access to transport is a condition of paramount importance if we want to achieve, not only the environmental benign outputs of proximity, but also the social outputs. Addressing the local use from the point of view of people's everyday mobility, requires taking into account the different accessibility provided by each urban transport mode. In this context, the most easily available trips are those that can be performed by walking (Preston and Rajé, 2007).

Furthermore, in relatively short distances, walking is a very competitive mode of transport. It is much more accessible than private car and, being an individual mode of transport, is not constrained by predetermined schedules or routes, as is public transport (Lavadinho, 2006).

In terms of time, a short trip is one that takes less than 10 min (Ryley, 2006, 2008) and also represents an appropriate walkable distance (McCormack et al., 2008). Because of the regular pedestrian speed (about 4 km/h) walking trips provide a stable conversion from travel time to distance travelled (Duffy and Crawford, 2013; Ritsema van Eck et al., 2005; McCormack et al., 2007).

Therefore, proximity trips are identified as those trips that are made by walking and are taking less than 10 min. If we were to assume an unlikely constant walking rhythm with no stops or interruptions, this 10 min trip would allow us to travel 650 m of linear distance. It is, therefore, a trip that takes place well inside the neighbourhood limits (Li et al., 2005; Sugiyama et al., 2010) and is a clear indicator of local activity. At the same time, it also represents the most basic kind of trip available in any urban environment.

2.2. Barcelona as a European, compact and diverse urban environment

The study area of this research is the municipality of Barcelona, capital of the Autonomous Community of Catalonia, located in the northeast of Spain. In 2012, it had 1.6 million inhabitants, one million of them being of working age (16–64 years old). The city has a compact urban environment, characterised by constant high densities (Matas and Raymond, 2008; Muñiz and Galindo, 2005). Mixed land uses are also an important feature, especially with a commercial structure marked by small retail businesses. Furthermore, the first councils of the democratic era made a great effort to provide good services and facilities throughout the whole city (Busquets Grau, 2005). On average, every square kilometre has up to five educational institutions, as community facilities and public provisions cover 10% of the total surface area. Only 10 out of 73 neighbourhoods have less than 5% of the total area devoted to public equipment and facilities (Miralles-Guasch and Marquet Sarda, 2013).

The city also has a public transport system with a broad spectrum, consisting of a large distribution of metro lines, trains, trams, and buses throughout the municipality. On average, one can find 34 public transport stops of all kinds every square kilometre, making public transport accountable for one third of everyday mobility. The rest of the mobility is covered, either by walking (47.3% of trips) or by private transport (22.1% of trips). Finally, the rational design of street patterns, which is also a significant aspect of sustainable development is, plainly, fulfilled with the major presence of Eixample Cerdà district of Barcelona, (Pallares-Barbera et al., 2011) that provides the necessary connectivity for short walking trips (McCormack et al., 2007).

Overall, the city provides a homogeneous and compact city-like urban environment and, because of its regular physical settings, constitutes a suitable area within which to study spatial behaviours of people. Barcelona, ultimately, shapes a proper urban environment, where proximity travelling is potentially possible and, therefore, boosts the importance of the socioeconomic and transport factors, with respect to explaining local travelling.

2.3. Data sources

The main data source is a wide mobility survey, Everyday Mobility Inquiry (hereafter, EMQ06), that was performed in 2006 (ATM and GC, 2006). This survey is an initiative of the Department of Territorial Policy and Public Works of the Generalitat of Catalonia (Regional Government of Catalonia) and the Metropolitan Transport Authority. It aims to describe the mobility of the resident population of Catalonia and, in the same way as most international surveys, it identifies one trip as one motivation to move (Miralles-Guasch, 2012). The Computer Assisted Telephone Interview (CATI) was used to survey individuals who reported having made any journey on the workday referred to in the interview.

EMQ06 provides travel data of a sample greater than 24,000 people, living in the city. This large number enables in-depth analysis, linking mobility data with some of the sociologic characteristics that were also included. Within the large set of socioeconomic variables available, we chose to test the relevance that five of those variables had on the configuration of proximity trips. Those five variables were: gender, age, professional status, access to motorised transport and availability of a private vehicle. Although the survey provides data for ages from 4 years old, our study only deals with the active population (16–65 years of age), since they display a higher concentration of trips. Furthermore, they undertake more travel and have major temporal constraints in their daily mobility.

To complement the survey data, we also used some official statistical data provided by IDESCAT (2006) and the Municipality of Barcelona (BCN, 2006) which come disaggregated with respect to neighbourhoods. These data were used to create two extra variables: income level and public transport supply. Income has been found to be a relevant factor on most studies regarding travel behaviour (De Witte et al., 2013), and it is important to include the role that public transport has on the mobility patterns in Barcelona (Curtis and Scheurer, 2010). Three income groups were used to calculate Barcelona's average income for year 2006. High- and-low income groups were defined as those that were at least 25% higher (lower) than the city average. The same criterion was applied in order to calculate the public transport offering, based on the density of metro, bus and railway stops.

2.4. Methods of analysis

A cross-sectional study was performed using descriptive statistics and by examining how often each population subgroup made use of the proximity trips. This allowed recognition of the main trends that could be further explored with the CHAID method. The CHAID method of analysis, first described by Kass (1980), is a simple representation of the existing relationship within a dataset, in the form of a decision tree. Decision trees split the data to form homogeneous subsets, but they differ from other regression analyses by making the decision of which predictor comes into play at a more localised level (Sullivan and van Zyl, 2008). At each node, the decision on which an independent variable is most related with the dependent variable is calculated, but only within the subpopulation in that node and the relation is measured via Chi-Squared testing (Horner et al., 2010). The result is a hierarchical representation that can be used for both analysis and prediction (Pitombo et al., 2011; Yang et al., 2013; Zhang et al., 2014) and that is, typically, used to explore group differences, based on categorical predictor variables (Lahmann and Kottner, 2011). All analyses were conducted on SPSS 19 for Windows (SPSS Inc., Chicago, IL).

3. Analysis

3.1. Proximity and main variables

Our consideration of proximity trips, such as walking trips taking less than 10 min, represents 23% of the total mobility performed by citizens between 16 and 64 years of age in Barcelona. Overall, they total 864,857 trips every day, and they are being used for all kinds of purposes, from going to work, to social visiting or going to the doctor. Likewise, these trips are not concentrated on a single social group, but on the contrary, are common to most of the social groups that were analysed.

Trip motivations clearly determine the characteristics of the journey, as 33.8% of all personal trips are covered by a short walk. Behind the category of personal mobility, there is a large variety of different purposes and activities that are covered with short walks, such as "going shopping" (64.4% of trips for this purpose being made by walking in less than 10 min) and "accompanying people" (which, basically, refers to taking children to school) (37.9%), being the most significant ones (Table 1). Notwithstanding, figures referring to personal mobility should not overshadow the fact that 12% of the occupational mobility (i.e., going to work or to study) is still performed within the local scale of the neighbourhood.

This link between purpose and travel behaviour also impacts on the time of the day when short walking trips are undertaken the most. While proximity trips are fairly scattered throughout the day they are, clearly, more intense between the time interval of 9 am–13 pm, in which up to 32.8% of trips that are being made in the city correspond to local travelling (Table 1). In contrast, short walking trips are less frequent in morning peak hours (7 am–9 am), a time slot where occupational mobility is hegemonic.

The utilisation of local travel is socially heterogeneous. Every group relates differently with local travelling, as shown in Table 2, where the frequency with which each group undertakes short walking trips (column A) is displayed. We have also taken into account how much of the total mobility taken by a specific group corresponds to personal or occupational

Table 1
Proximity trips by social group, and share of proximity trips relative to total amount of travels performed by each group.

	Total number of proximity trips	Proximity trips in relation with total trips (%)
Barcelona	864,507	22.9
Purpose distribution		
Occupational mobility		
Study	28,351	16.7
Work	89,318	11.4
Personal mobility		
Shopping	123,709	64.4
Going to the doctor	11,960	17.6
Social activities	26,162	22.4
Accompanying people	63,188	37.9
Personal business	23,405	19.6
Leisure	77,957	27.9
Others	18,527	26.0
Temporal distribution		
Morning		
7 am–9 am	75,745	13.9
9 am–13 pm	228,681	32.8
Midday		
13 pm–15 pm	109,976	22.7
Afternoon		
15 pm–18 pm	159,682	22.0
18 pm–22 pm	366,251	23.8

Table 2
Proximity trips upon the main studied variables.

	Sample profile		A. Actual proximity engagement	B. Personal mobility engagement	C. Professional mobility engagement	D. Proximity engagement on personal mobility	E. Proximity engagement occupational mobility	F. *p*-Value
	n	(%)	(%)	(%)	(%)	(%)	(%)	
Gender								<0.01
Male	*28,647*	*49*	**19.8**	43.8	56.2	31	11	
Female	*30,099*	*51*	**25.8**	59.2	40.8	35	12	
Age								<0.01
Young (16–29)	*15,910*	*27*	**20.4**	44.4	55.6	29	14	
Young-adults (30–44)	*22,264*	*38*	**22.7**	49.0	51.0	36	10	
Adults (45–64)	*20,572*	*35*	**24.9**	60.2	39.8	33	12	
Professional situation								<0.01
Employed	*38,783*	*66*	**19.4**	39.6	60.4	32	11	
Unemployed	*19,963*	*34*	**29.6**	75.2	24.8	34	16	
Income								<0.01
Low income (< 80% BCN)	*12,514*	*21*	**24.2**	51.4	48.6	36	12	
Average income (80–125% BCN)	*35,747*	*61*	**22.7**	51.8	48.2	33	12	
High income (>125% BCN)	*9860*	*17*	**21.6**	52.0	48.0	32	11	
Access to motorised transport								<0.01
None	*23,848*	*41*	**27.1**	55.7	44.3	36	16	
Some	*34,898*	*59*	**20.0**	49.0	51.0	31	9	
Public transport supply								<0.01
Low public transport supply	*10,851*	*18*	**21.2**	52.9	47.1	29	13	
Average Public transport supply	*33,326*	*57*	**23.5**	51.4	48.6	35	12	
High public transport supply	*14,569*	*25*	**22.5**	51.4	48.6	33	11	

A. % of all trips that are walking and <10 min.
B. % of all trips that are invested in personal mobility.
C. % of all trips that are invested in occupational mobility.
D. % of personal mobility trips that are walking and <10 min.
E. % of occupational mobility trips that are walking and <10 min.
F. *p*-Value. Statistical significance (Chi-Square test) of the variable in relation with Actual proximity engagement.

purposes (columns B and C) and also, specifically, how frequently they use short walking trips when engaging in personal or occupational purposes (columns D and E). We use the additional values in columns B–E, in order to incorporate nuances into the analysis, and to understand how local travelling is not just a matter of the purpose of the trip, but is also socioeconomic- and transport-related in nature.

3.1.1. Socioeconomic factors

3.1.1.1. Gender and age. Gender is, usually, found to cause a major difference in mobility patterns between men and women, as in modal choice (Law, 1999; Polk, 2003). Proximity utilisation is no exception, as women use short walking trips on 25.8% of occasions, compared with 19.8% for men. Women not only take more personal trips (59% of their mobility is devoted to personal reasons compared with 43.8% for men), but personal the trips they do take are more frequently solved with a short walking trip (35% compared with 31% for men [column D]). Overall, short walks for personal purposes represent one fifth of daily mobility for women, while being only one seventh of mobility for men.

In general terms, as age increases, so does the use of the neighbourhood. While young people tend to make, on average, use of the local trips, in older cohorts this percentage is increased. This is an important factor, because cohorts of 30–44 and 45–64 years of age are those that have more obligations, activities and a more compressed time schedule (Lucas, 2012). Social groups with tighter schedules and smaller space–time prisms, as with adult women, tend to rely more on the local scale when possible, especially for the personal trips. In contrast, younger people (16–29 years of age) make fewer personal trips (44.5%) and even fewer of those trips are within the proximity scale (29%); all of which accounts for short walking trips representing only 20% for younger mobility, compared with 25% for older cohorts.

3.1.1.2. Professional status. Professional status is another key determinant of local travel. Employed and unemployed people seem to have very different mobility patterns, and this is reflected in the frequency of their use of local scale. Trips performed by employed people are within the local scale for 19% of the time, while trips performed by unemployed people, for 30% of the time. While they show a similar ratio of use of proximity on their personal trips (32% and 34%), the differences are, mainly, located on the total amount of these personal trips that they take. In that way, 75% of the trips made by the unemployed are personal related and it is this enhanced role of personal travel that results in using short walking trips more often. Once again, even when considering a trip for the same purpose, unemployed people tend to use short walking trips more often than employed people.

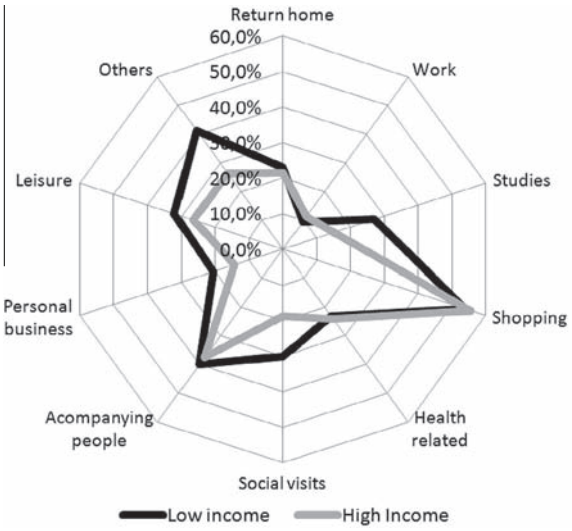

Fig. 1. Proximity trips by trip purpose and income.

3.1.1.3. Income. Although there are only 2.6 percentage points difference on the average use of the local scale between high- and low-income people, income provides a clear pattern on which lower-income groups perform more proximity trips than upper-income groups. The differences are not found on the professional mobility, as all income levels show nearly 12% of local scale utilisation, but on the personal portion. In this personal dimension of mobility, while lower-income groups rely on the proximity scale on 36% of occasions, higher-income groups do so on 32% of occasions, and that leads to a slight difference in the global share of the use of proximity. Fig. 1 shows this distribution by taking the motivation of the trip into account and helping to visualise these differences. Low-income individuals (in black) use short walking journeys more often for personal purposes, such as *social*, *personal business*, *leisure* or *others*. The wealthiest group, instead (in grey), solves their *work* and *shopping* necessities with a walking short trip, slightly more often.

It is also interesting to see how high income individuals are using short walking trips more often in order to get to work (Fig. 1), which may disclose that they live closer to their workplaces. This relationship, however, is reversed in the case of study locations, where low income groups travel with a proximity trip much more often than high-income groups. Finally, 30% of the socially-related trips taken by low income groups are walking journeys resolved in less than ten minutes, in comparison with only 18% of the wealthiest of people.

3.1.2. Transport related variables

3.1.2.1. Access to mechanised transport. Access to the different modes of transport has been consistently found to be a determinant of travel behaviour (Santos et al., 2013). But, how does having access to private or public transport correlate with local travelling? Is the local scale, merely, a resource for those who have no access to a car? How does the supply of public transport modify the use which people make of their neighbourhood? The last two variables in Table 2 aim to answer some of these questions.

Significantly, those who have no access to a private car are the ones who use local trips the most (27.1%). In contrast, those who do have access to a car only resort to using their near environment for 20% of occasions. There are no significant differences between people living in neighbourhoods with high public transport supply, who are using short walking trips for 22.5% of occasions, and those people with low public transport supply, at 21.2%. The balanced offer of public transport throughout the whole city makes access to public transport a variable of low impact in our study. The main differences for local travelling are caused, thus, by the dichotomy of having, or not having, access to a car.

In Barcelona, 353,078 people between the ages of 16 and 64 years have no access to a car. This accounts for 37% of the total population in this age range. Depending exclusively on walking, biking and public transport does not make them move less; furthermore, they are responsible for 41% of the total trips made every day. As the potential activity paths of this group of people are marked by lower moving speed, they turn, to a greater extent, to proximate urban scales, in search of near services and facilities.

As shown in Fig. 2, people with access to a car (in grey) make use of the local scale, consistently, less than people without access (in black), in all except the one trip purpose. The main differences are found in the *studies* and *accompanying people* categories. The only purpose that people with access to a car tend to engage in more in the proximity environment is a trip for medical reasons.

Furthermore, it is also important to note how people with access to a car use a proximity trip to *go to work* on 9% of occasions, while people without access, get to work with a short walking trip on 14% of occasions. Even more noteworthy, are the differences within the *study* category (8.4% versus 20.4%).

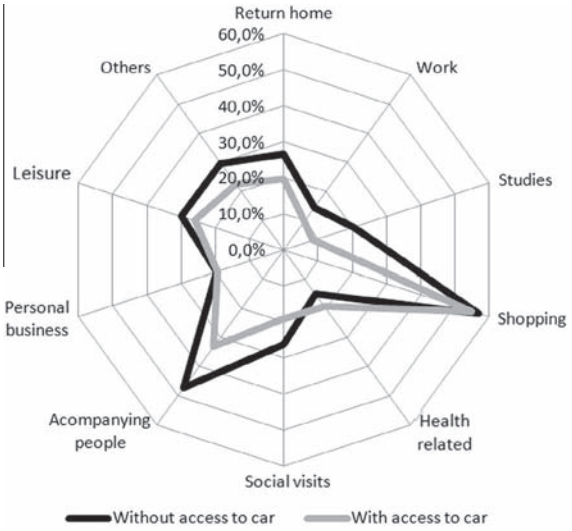

Fig. 2. Proximity trips by trip purpose and access to car.

3.2. Hierarchy of factors

To see how the combination of different variables played a role in determining proximity, we used two different CHAID answer trees, one for the socioeconomic factors and the other for the transport-related factors. The trees sort out the independent variables in order of relevance with respect to explaining the dependant variable. In that case, all variables are set to explain proximity trips. On the final layout of the tree, the upper variables are more relevant at explaining the presence of proximity trips than the lower variables.

3.2.1. Answer tree for socioeconomic factors

The socioeconomic CHAID answer tree was set to calculate the importance of the variables of gender, age, professional situation and income with respect to explaining local travelling (Fig. 3).

As can be seen by its graphically explicit output, the most important socioeconomic factor at explaining local travel is professional situation. The great differences on the use of these kinds of trips, between employed and unemployed, cause

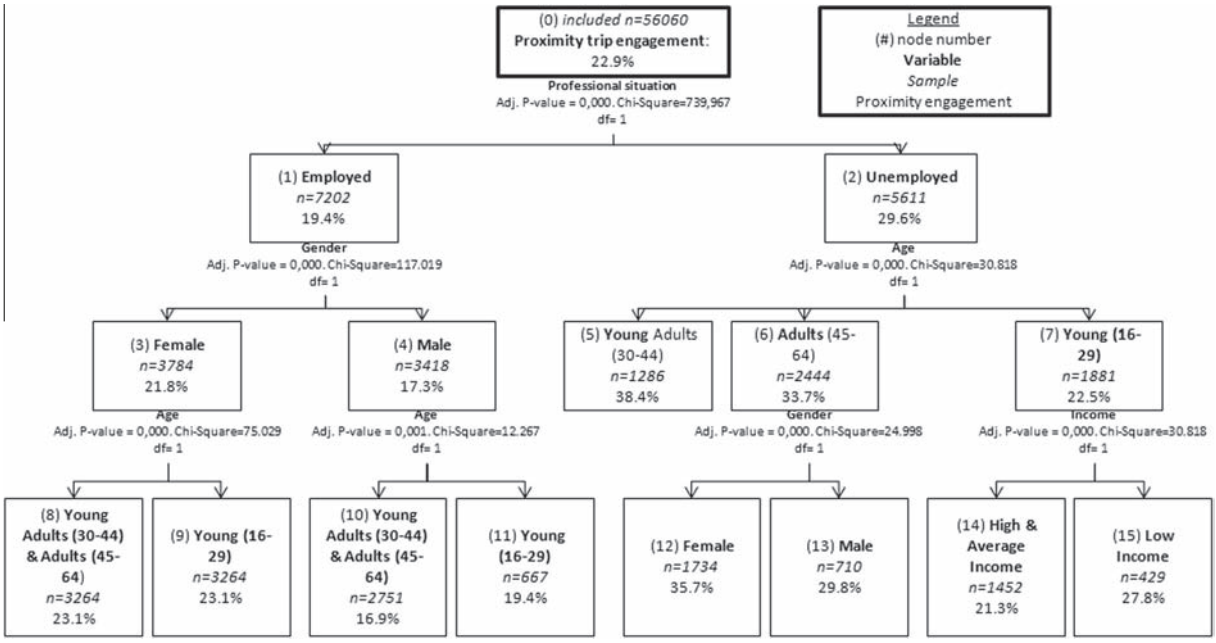

Fig. 3. Socioeconomic CHAID tree.

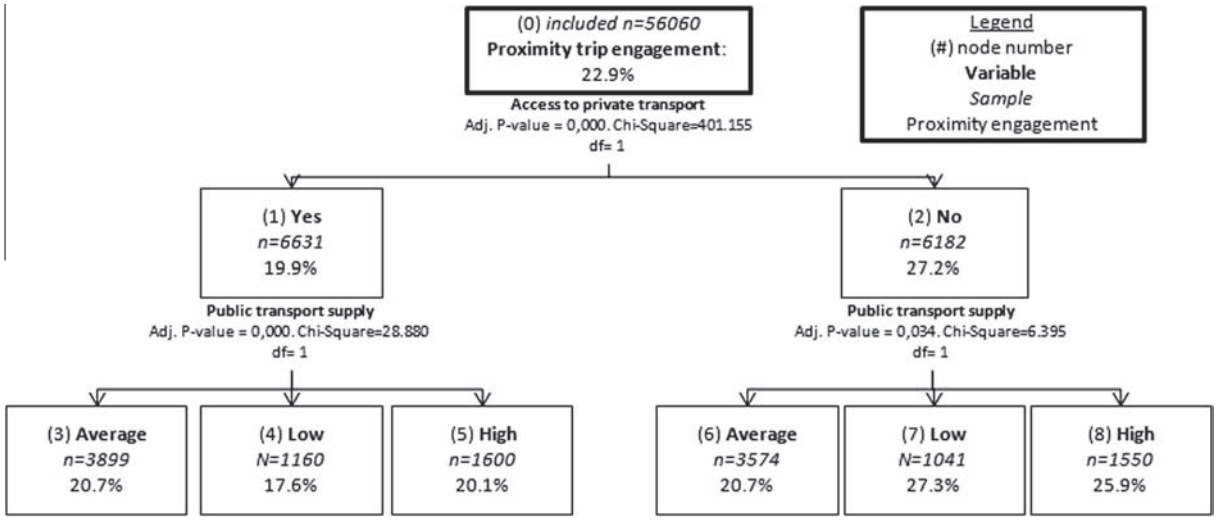

Fig. 4. Access to transport CHAID tree.

the first major division of the tree. If we focus on the employed branch, with those who are using proximity in 19.4% (node 1) of their trips, the next main variable is gender, as employed women use proximity in 21.8% of their trips (node 3), against 17.3% for employed men (node 4). Finally, the last variable depicted by the CHAID model for the case of the employed is age. Both for men and women, the younger cohort (nodes 9, 11) behaves differently than the 30–64 years of age ranks (nodes 8, 10). However, it is still interesting to see how, while employed young women (node 9) are using proximity much less than their adult counterparts (node 8), in the case of employed men, younger cohorts (node 11) use the proximity much more than older cohorts (node 10).

On the right side of the tree, depicting the use of short walking trips by unemployed people, the main variable is not gender, but age. In this case, there is a clear break between the unemployed who are older than 30 years (nodes 5, 6), and who are using proximity trips for 38.4% and 33.7% of their trips, and the unemployed who are younger than 30 years of age (node 7), who show a much lower share of local use (22.5%). Finally, the income variable is only found relevant inside the *unemployed young* category. In this specific social group, average- and high-income individuals tend to use proximity less (node 14.21%) than lower-income individuals, who use it on 27.8% of their journeys (node 15).

3.2.2. Answer tree for access to transport variables

The second answer tree is restricted only to the variables related with people's access to transport. The specific aim of this tree is to show how access to transport, both private and public, has an impact on people's activity spaces and, therefore, on the way they make use of their nearby urban environment (Fig. 4).

The main variable in this tree is having, or not having, access to private transport. The first category shows the frequency with which proximity is used by those who have, or do not have, access to a car. As we have already seen, those without access to a private vehicle are the ones who rely on the local scale the most (node 2: 27.2%). Among them, the most important variable is the kind of access they have to public transport. The model shows how those who do not have any private vehicle available, but live in a neighbourhood with high public transport supply (node 8) do not use as many proximity trips as people living in areas with low or average public transport supply (nodes 6 & 7).

Car users (node 1), instead, have to deal with congestion and parking problems, hence, their travel behaviour is more sensitive to having, or not having, good public transport alternatives. In this sense, car drivers who choose not to drive may not use the local scale when they have good or average public transport facilities (node 5: 20.1%; node 3: 20.7%). In contrast, drivers who live in neighbourhoods with poor public transport possibilities choose to drive to a greater extent and, therefore, proximity utilisation is also scarcer (node 4: 17.6%).

4. Discussion and conclusions

This study aims at advancing understanding of proximity dynamics in the city. We analyse how specific social groups, defined by some key socioeconomic variables, make use of the urban local scale. We identify local trips as walking journeys lasting less than 10 min, with specific conditions for a trip that embodies brevity, a short distance, and universal accessibility. Departing from a large travel survey on everyday mobility, we use travel time and modal choice to analyse the use that every social group is making of their neighbourhood. Then, a CHAID decision tree technique was used to determine hierarchies between these predictive factors.

Daily, nearly one out of four trips taken by individuals in Barcelona covers less than 650 m and is made by walking. This speaks of a dense and compact physical morphology with mixed land uses and good provision of services. It is the structure of the city that makes these short trips possible, as other urban morphologies do not provide the necessary mix of services, commerce, jobs or amenities in an adequate range. Notwithstanding, it is the socioeconomic factors which, mostly, determine the frequency by which these proximity trips are finally taken (Van Acker et al., 2010).

Short walking trips appear to be much more frequent on journeys that seek a personal purpose, such as shopping, getting children to school or visiting relatives. On a large level, those population subgroups that take more personal trips also use proximity more often. But, going beyond that general observation, factors like age, gender or time availability are also important.

The results show how the use of proximity increases with age. As people grow older, so does the complexity of their personal schedules (Lucas, 2012) and, thus, they need to either find closer destinations or travel faster to get to farther destinations. Temporal constraints lead people to resort more often to the local scale, in search of easily accessible opportunities, available inside their neighbourhood (Camarero and Oliva, 2008).

But, this observable fact is not equal in terms of gender. Our results are fully coincident with the observation of Frändberg and Vilhelmson (2011) on how gender is determining both the length and the modal choice of most journeys. Results also show that men tend to solve their busier schedules by increasing motorisation which is, largely, consistent with the findings of Ryley (2006) and, furthermore, by reducing the number of proximity trips they take. In contrast, women tend to solve their schedules by increasing the number of their trips within their neighbourhood. The well-documented fact that adult women are assuming more tasks (professional and maintenance) (Neutens et al., 2011; Schwanen et al., 2002) while having less access to motorisation (Scheiner, 2010), is solved in the case of Barcelona by a more frequent use of the local facilities. This same pattern can be observed in other social groups, such as people with constrained mobility capacities and little time available, who tend to rely more on the proximity scale, while others with more flexible frames do not.

The travel behaviour, for occupational purposes, of those without access to a car is particularly interesting, as they resolve occupational mobility with a short walk on 16% of occasions, compared to 9% for car users. This denotes the land mix of Barcelona that has kept a portion of the jobs near residential places and, more importantly, it also suggests that having jobs and schools closer to residential areas is an important factor in deciding not to own a private vehicle.

The relationship between transport and local travel can also be appreciated with respect to the income factor. Studies have found that, in general terms, access to cars and travelled distances increase in parallel with income (Santos et al., 2013). Following this trend, what is observed in Barcelona is that lower-income groups are using their nearby resources more often. More importantly, income seems to determine the spatial distribution with respect to where the activities are undertaken. Low-income groups tend to locate their social relations closer, an idea previously expressed by Lazo (2012), Jouffe and Lazo, (2010) and Ramadier (2002), that has direct implications for local identity, community engagement and social capital.

CHAID analysis has allowed visualising the relations between the main variables, and how they affect the use of short walking journeys. The significance of the professional situation at determining proximity was an unexpected result that opens relevant public policy implications, especially in a country with a high unemployment rate, such as Spain. These results are coincident with what Mercado and Páez (2009) found on unemployed seniors and also with the findings by Forsyth et al. (2009), on how unemployed people were more likely to walk for transport. However, to the best of our knowledge, it is the first time where unemployed people of working age are found to be, not only more prone to walk, but also preferring short trips.

The use of the CHAID model has also made evident the huge importance of having, or not having, access to private transport on the shaping of travel behaviours. Even in a compact urban environment, such as in Barcelona, people with a car are much less prone to take a short walking trip than people without a car. Again, this is not a new finding, as the association between access to car and travel behaviour has been abundantly explored. But, from a policy point of view, it fully demonstrates that everyday mobility in Barcelona can be fulfilled without a car, and that most of the motorised trips could actually be converted to proximity short trips. It is thanks to having nearby destinations, that 37% of the population can live without a car, without being at risk of social exclusion, as happens in other urban areas (Lucas and Jones, 2012). In terms of policy, finding that more than a third of the population is using proximity trips to perform daily mobility, should encourage policy makers in Barcelona in its anti-car efforts. In our opinion, in dense and compact cities like Barcelona, where proximity makes life without a car completely possible, sustainable ways of moving, such as short walking trips, should be strongly promoted.

On a more global level, these specific findings should also encourage urban planners to promote provisions for density and localised services, as results clearly show that people tend to use more sustainable trips when proximity is available. Also, and as noted by Manaugh and El-Geneidy (2012), incentivising localised and short-distance travel in active modes of transportation should replace road capacity and transit speeds as a tool to improvement of urban accessibility. Furthermore, the fact that the more vulnerable social groups are major users of proximity indicates that promoting dense and diverse environments may help alleviate their situation and contribute to a more democratic and egalitarian urban environment. Finally, and as suggested by Hulsbergen et al. (2006, p. 248), analysing the behaviour of users who intensively utilise the lowest levels of scale of the city should point out strategies to effectively shape these small-scale spaces, both spatially and functionally, in order to make them even more attractive.

Acknowledgements

The authors would like to thank Dr. Matt Copley for his professional proofreading services and for his editing suggestions. We would also like to thank the reviewers for making a range of very constructive comments, which greatly helped us improve an earlier version of our paper.

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Social Science & Medicine 135 (2015) 24–30

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Neighbourhood vitality and physical activity among the elderly: The role of walkable environments on active ageing in Barcelona, Spain

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ARTICLE INFO

Article history:
Available online 22 April 2015

Keywords:
Spain
Active ageing
Physical activity
Active mobility
Neighbourhood vitality

ABSTRACT

This study investigated whether neighbourhood vitality and walkability were associated with active ageing of the elderly. Immobility, activity engagement and physical activity were explored in relation with age, gender and walkability of the built environment. Number of trips per day and minutes spent on walking by the elderly were extracted from a broad travel survey with more than 12,000 CATI interviews and were compared across vital and non-vital urban environments. Results highlight the importance of vital environments for elderly active mobility as subpopulations residing in highly walkable neighbourhoods undertook more trips and spent more minutes walking than their counterparts. The results also suggest that the built environment has different effects in terms of gender, as elderly men were more susceptible to urban vitality than elderly women.

1. Background

Like many European Countries, Spain faces the challenge of a rapidly ageing population. Having an old age dependency ratio of 26.3, the pace of ageing is much higher in Spain than in other countries, and it is projected that by the year 2050 its old age dependency ratio will be 26% higher than that of the EU28 (EUROSTAT, 2014). Barcelona's Metropolitan Region is no exception to that general dynamic and in 2013 it had 17.4% of its population older than 65 years, with an elder-child ratio of 107 (IDESCAT, 2013). Within the next 15 years, 22% of the population will be above 65 years of age and the elder-child ratio will be 147. The increase of the senior population, not only in Spain but all over Europe, has focused public health policies on the need to promote healthier mobility habits in favour of physical activity (PA) and activity engagement.

PA directly affects several health issues in the general population, all of which become more urgent in the age range of the elderly. The World Health Organization (WHO) identifies the lack of PA as the fourth global risk factor, globally accounting for 6% of deaths (World Health Organization (WHO), 2010). In general terms, more active individuals have lower mortality rates, in comparison with people who remain sedentary (Gregg et al., 2003; Stessman et al., 2009). Other demonstrated effects of the lack of PA are cardiovascular diseases, some types of cancer, arthritis and obesity (Ewing et al., 2014; Jongeneel-Grimen et al., 2014). According to the current recommendations, seniors should perform moderate-intensity PA, for at least 150 min throughout the week, which can be the result of adding shorter PA bouts (WHO, 2010). Over the past few years, there has been a great increase of studies linking PA with general health status (Ewing et al., 2014, 2008; Jongeneel-Grimen et al., 2014), and specifically with elderly mobility (Moniruzzaman et al., 2013; Páez et al., 2007; Hildebrand, 2003).

In terms of transportation, walking has been seen as the key for resolving most elderly problems related with PA. Walking for transport is a major source of physical activity, especially for people over 65 years of age who perceive the options for using other types of transport as being reduced (Balboa-Castillo et al., 2011). Walking is seen as a convenient, safe and adequate activity for seniors as it places the right amount of stress on joints in the human body (Moniruzzaman et al., 2013). The recognition of walking as a means of transport and as a source of moderate PA has led urban planners to focus on creating walkable environments that make active mobility more appealing (Clarke and Nieuwenhuijsen, 2009; Handy and Boarnet, 2002; Lamíquiz and López-Domínguez, 2015; Talavera-Garcia and Soria-Lara, 2015).

Furthermore, urban settings not only determine PA but also psychological wellbeing and mental health (Fujiwara and Kawachi,

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http://dx.doi.org/10.1016/j.socscimed.2015.04.016
0277-9536/

2008; Clark et al., 2007). Studies have demonstrated how mental health depends heavily on social capital (Bowling and Stafford, 2007) and resources that individuals can access through their networks (Fujiwara and Kawachi, 2008). For individuals above the age of 65 years, living in a vital and thriving urban environment may mean undertaking more trips, engaging in more activities (Hildebrand, 2003) and interacting with more people in their everyday life (Kuo et al., 1998; Kweon et al., 1998). All of the aforementioned contributes to increasing their social capital status while avoiding social exclusion processes derived from immobility (Hanibuchi et al., 2012; Richard et al., 2009; Leyden, 2003). The relation between built environment attributes and mental health condition is thus recognised through the number of activities which the elderly can perform within a walking distance.

Currently, there is enough empirical evidence to corroborate that the way neighbourhoods are designed influences walking behaviour (Villanueva et al., 2014). At an age where adults experience a reduction in functional capacities, the settings of the built environment become even more important, as they have the potential to either compensate the deficits in mobility capacity or to exacerbate mobility problems (Dujardin et al., 2014).

There are few articles that try to assess both the physical and mental health of the elderly through their use of active mobility. Most of the research is focused either on PA of seniors (Kerr et al., 2012; Lockett et al., 2005; Michael et al., 2014, 2006, 2010) or on the social capital status of seniors (Bowling and Stafford, 2007; Fujiwara and Kawachi, 2008; Hanibuchi et al., 2012; Leyden, 2003; Richard et al., 2009), without always realising that neighbourhood settings have the potential to determine both the modal choice of the trip (and thus the PA) and the number of trips that the elderly undertake, which relates with activity engagement. Furthermore, and as Sugiyama et al. (2014) suggest, limited variation in environmental attributes may be causing most non-significant or weak associations between neighbourhood environmental attributes with physical activity.

Hence, we believe that the analysis of how the built environment determines the health of seniors, through promoting active mobility, is far from being closed. Our study aims to understand how living in vital or non-vital urban areas can change the travel behaviour of the elderly along with the amount of PA that they are gaining from walking for transport.

Our view of urban vitality takes the seminal works of the American city activist, Jane Jacobs (1961), who measured the vitality of an urban area by using the walking activity on the streets as a reference. For Jacobs, the vitality of the streets was a product of the diversity of the built environment, and the presence of pedestrians served as an indicator of the city liveliness (Sung et al., 2013). We thus understand urban vitality as a synonym of vibrant environments and we measure this vitality, not from a set of morphological indicators (Aditjandra et al., 2012) nor as a personal well-being indicator (Guite et al., 2006; Richard et al., 2009), but through the observation of mobility patterns. Those areas where a large part of daily mobility is performed through short walking trips are labelled as vital areas. The presence of short walking trips characterises not only areas with a high intensity of pedestrians, but also by their proximity to services, amenities, and land use mix (Marquet and Miralles-Guasch, 2015; Morency et al., 2011), forming a particularly suitable urban environment for ageing populations (Marquet and Miralles-Guasch, 2014) and shaping what American urban planner Kevin Lynch understood was a place that supported the biological requirements and capabilities of human beings (Lynch, 1981, p. 118). Having pedestrians on the street increases the appeal of walking (Gehl, 2010) and the potential enjoyment of the trip (Gehl, 2011, p. 68), also making walking more attractive for the elderly. In contrast, areas where short walking trips are scarce often represent low-density built environments that offer neither proximate facilities nor vibrant street life for elderly walkers.

Comparing the health outputs of the elderly populations living in vital or non-vital areas can provide an idea of how much healthy mobility habits can be improved by investing in vital built environments.

2. Sources and methodology

In order to understand the determinants of physical activity and activity engagement for the ageing population, we need information sources where all types of daily trips are treated in the same way. Daily travel surveys, such as the one used for the present study are useful because of their homogeneous treatment, including all types of means of transport, trip purposes and journey durations. In this methodological section we intend to address both data sources and the reasons for choosing our population and territorial variables along with the methods of analysis.

2.1. Data sources and measures

The study took place in Barcelona's Metropolitan Region (RMB), a 3200 km^2 metropolitan area located north-east of Spain, made up of 164 municipalities that gather a total of 4,635,5421 inhabitants. The region is strongly centralised within the Barcelona environment, but it gets polycentric, discontinuous and disperse as one moves away from the core of Barcelona (Muñiz and Galindo, 2005).

The main data source is a broad travel survey, Everyday Mobility Inquiry (ATM and GC 2006), that was performed in 2006 (hereafter, EMQ06) by the regional authorities in Catalonia (Spain). It aims to describe the mobility of the resident population of Catalonia with 106,091 Computer Assisted Telephone Interviews (CATI), out of which 45,184 were located in our area of study, Barcelona Metropolitan Region (RMB). The interviews were used to gather data regarding trips taken in a working day and also included some socioeconomic input about the interviewee.

Mobility data and variables, such as number of trips, modal choice, travel duration or physical activity related to transport per person were extracted from the EMQ06. However, other sources were needed to gather socioeconomic variables at the neighbourhood level, such as income or motorisation levels, and territorial variables like population density or land use distribution. Socioeconomic data were extracted from the official Statistics Institute of Catalonia (IDESCAT) and the official Statistics Service of Barcelona.

Our focus was set on the health-related aspects of travelling for the elderly population, particularly on the rates of change of healthy mobility habits that can be gained from moving from a non-vital area to a vital area. The study represents the built environment on its most local scale, which is consistent with the analysis of a population with low mobility potential (Prins et al., 2014). Health outcome variables are divided into activity engagement measures and physical activity measures. Firstly, immobility is a dichotomous proxy for activity engagement. In that, following a fairly common definition of immobility (Sikder and Pinjari, 2012), when a person claims not to have left the house the day prior to the interview, we consider it a case of immobility. Secondly, activity engagement is a continuous variable: number of trips made on the day prior to the interview. This variable provides the average number of trips in terms of age, gender and urban vitality. PA measures are expressed through two variables: modal choice and number of minutes spent on walking. All the results were stratified by gender (male/female), age (64–75 and >75 years) and urban vitality (vital or non-vital).

2.2. Study areas and population sample

Our target of study was that of the census population of citizens over 65 years of age. This large group was divided into two subgroups, consisting of Seniors (65–74 years of age) and Elderly Seniors (75 years of age and older). This distinction was necessary as travel behaviour changes with respect to the physical possibilities and moving capacities of the studied population (Kerr et al., 2012). Gender was also taken into account as males and females show very different modal choices as well as different allocations of travel times and trip purposes (Hanson, 2010; Miralles-Guasch et al., 2015). Having divided the older population by age and gender, we were able to analyse how the territorial settings and vitality of their built environment determined their travel behaviour and the total amount of physical activity they were gaining from transportation.

The neighbourhoods were sorted between vital and non-vital areas, vitality being measured through the frequency on which the general population of each study area were taking short walking trips. We used a 10 min threshold to define a short trip, a temporal measure consistently used in previous transport studies (Ryley, 2008; Li et al., 2005). The general assumption was that the way in which the residents of each area were moving was indicative of the physical settings and walkability of the area. Furthermore, we hypothesised that a neighbourhood that enabled short walking mobility for the general population would also be encouraging for the active mobility of the elderly (Moniruzzaman et al., 2013).

On average, people in the Barcelona Metropolitan Region were using short walking trips for 27% of their everyday trips (standard deviation = 9.6). We decided to label those study areas that had a use of short walking trips above the 31.8% (+1/2 SD from the average) as vital areas. Those vital areas had 15% more population density than the average, with a building typology consistent with attached dwellings with abundant commercial facilities (see Table 1). Conversely, those areas with less than 22.2% (−1/2 SD) of short walking trips were labelled as non-vital ones. These non-vital zones had lower population density (18% less than the average), higher average incomes and a land-use distribution which is dominated by single dwellings.

Assuming an average walking speed of 4 km/h (Duffy and Crawford, 2013; Ritsema van Eck et al., 2005) these 10-min-or-less walking trips cover a maximum topological distance of 650 m. This means that urban areas where a great part of the daily mobility is performed through those types of trips are vital areas where the optimum mix of population density, land use distribution, built environment design and connectivity, are offering to its citizens the possibility to reach daily needs inside a proximate area (Marquet and Miralles-Guasch, 2015). The result of this procedure was the selection of the most- and least-walkable urban environments, by observing the travelling behaviour of the overall population, not just the seniors (see Table 1).

3. Results

3.1. Trip frequency and activity engagement

The first measure of activity engagement has to be whether the person is mobile or immobile. Immobility is a major concern in ageing populations, when the natural decrease of personal physical capabilities forces the person to stay at home. The immobile person becomes dependant on others to fulfil their daily needs and this also prevents the person from fully participating in community life, increasing the chances of starting a process that moves towards social disadvantage or even social exclusion.

Of the total of 738,064 people older than 65 years of age and living in the metropolitan area, 114,399 (15.5%) declared not having made a single trip on the surveyed working day (see Table 2), when the general immobility ratio for the metropolitan region is set at 6.2%. Logically, this figure is strongly determined by age, because the immobility rate more than doubles itself as the 75 years old threshold (from 10.4% to 21.2%) is approached. Almost the same differences can be spotted in terms of gender, with 19.6% of females suffering from immobility against 9.6% of men.

The importance of the vitality of the area was also found significant, with a positive correlation between urban vitality and immobility ($r = 0.043$, $p < 0.001$). Areas with higher vitality have less immobility in every age and gender category. Also, the figures for the non-vital areas are found to be significantly higher in all but one category. The impact of living in vital or non-vital areas is strongest on the elderly seniors, where it can pose a change of 18%

Table 1
Descriptive characteristics of vital and non-vital areas.

Sample	Vital areas	Non-vital areas	Barcelona metropolitan region
	n (%)	*n* (%)	*n* (%)
Male	1813 (15.2%)	898 (7.5%)	4937 (41.1%)
Female	2994 (20.8%)	1215 (10.1%)	7082 (58.9%)
Senior (65–74)	2394 (19.9%)	1042 (8.7%)	6283 (52.3%)
Elder senior (75+)	1923 (16%)	1071 (8.9%)	5736 (47.7%)
Socioeconomics	Mean (*IQR*)	Mean (*IQR*)	Mean (*IQR*)
Municipality size	17839.9 (9769)	10324.6 (10625)	15678.9 (14405)
Average income	12901.6 (1814)	15469.5 (4638)	14297.7 (5270)
Vehicle/1000 hab	568.1 (333)	728.0 (226)	638.9 (140)
Population density	2456.4 (754)	1737.3 (768)	2133.9 (875)
Land use distribution	Mean (Std Dev)	Mean (Std Dev)	Mean (Std Dev)
Single dwellings	10.9% (12.3)	36.2% (26.6)	44.2% (24.1)
Attached dwellings	59.4% (18)	24.5% (21.5)	21.1% (21,6)
Industrial land	14.1% (11.9)	24.0% (18.3)	19.1% (15.2)
Business facilities	1.9% (1.7)	3.8% (4.8)	2.8% (3.3)
Commercial facilities	7.4% (2.9)	3.3% (2.7)	5.6% (3.2)
Services facilities	6.4% (4)	7.5% (5.4)	6.7% (4.7)
Rural areas	0.1% (0.1)	0.7% (2.2)	0.2% (1.2)
Total	100 (–)	100 (–)	100 (–)

Source: Own elaboration from EMQ06 and IDESCAT.

Table 2
Percentage of non-mobile population by gender age and area type.

Gender	Age group	Area type (%)			
		Vital (a)	Non-vital (b)	Total	Ratio (a/b)
Men	Senior 65–74	**6.5**	*8.2*	6.8	0.793
	Elder senior >75	13.4	*19.7*	13.5	0.680
	Total	**9.1**	*13.3*	9.6	0.684
Women	Senior 65–74	*13.8*	*13.8*	13.3	1
	Elder senior >75	**23.4**	25.6	25.5	0.914
	Total	**18.5**	*20.3*	19.6	0.911
Total	Senior 65–74	10.4	*11.1*	10.4	0.937
	Elder senior >75	**19.8**	*23.4*	21.2	0.846
	Total	**14.6**	*17.3*	15.5	0.844
	Population	*277,954*	*136,047*	*414,001*	

Source: own elaboration from EMQ06.
Test: Chi^2 sig = 000 all categories; Adjusted residuals test, corrected.
Italics: Significantly higher values.
Bold: significantly lower values.
** Non-significant data, insufficient sample frequency per cell.

in the number of immobile individuals. The most important differences are found in the case of male elderly seniors where nearly 20% of those who live in non-vital areas are immobile, compared with 13% of those living in vital areas. Furthermore, the population subgroup where immobility is more frequent is that of female elderly seniors, where more than a quarter of the population (25.5%) are not taking a single trip. In this group, the vitality of the neighbourhood is found to be significant at explaining lower values of immobility (23.4%).

The relation between age and number of trips is significant ($\chi^2 = 464.5$ $p < 0.001$), as well as the relation between gender and number of trips ($\chi^2 = 379.8$ $p < 0.001$). After these two main relations, the settings of the built environment are also found to be significant ($\chi^2 = 56.320$ $p < 0.001$). As shown in Table 3, the average senior on the metropolitan region undertakes 2.99 trips a day, but gender, age and location determine the exact rate of daily trips made by each population subgroup. As a constant, in vital neighbourhoods, people are taking more trips than in other areas. This increase does not change significantly in terms of age, as the differences are very similar when we compare Seniors (1.066 ratio) and Elderly Seniors (1.064 ratio). The significant differences are found for the gender variable. In general, women with more than 65 years of age take 21% less trips than men of the same age, but where a Senior male (65–74 years of age) is making 3.69 trips a day, a Senior female is making only 3.08 trips a day. The same trend is reproduced on the Elderly Senior category (3.02 vs. 2.33, respectively). Even more relevant, the number of total trips taken by Males is more affected by the vitality of the neighbourhood than those taken by women. Men living in a vital and proximate neighbourhood are taking 11.3% more trips than men who live in non-vital areas (1.127 ratio). In contrast, the trip rates for women are steady despite the territorial settings, and living in a vital area entails only making 4.1% more trips than those people who live in non-vital areas.

Table 3
Number of trips by gender age and area type.

Gender	Age group	Area type			
		Vital (a)	Non-vital (b)	Total	Ratio (a/b)
Men	Senior 65–74	3.84	3.46	3.69	1.110
	Elder senior >75	3.12	2.79	3.02	1.118
	Total	3.56	3.16	3.41	1.127
Women	Senior 65–74	3.04	2.96	3.08	1.027
	Elder senior >75	2.40	2.32	2.33	1.034
	Total	2.72	2.61	2.70	1.042
Total	Senior 65–74	3.41	3.20	3.36	1.066
	Elder senior >75	2.66	2.50	2.58	1.064
	Total	3.08	2.97	2.99	1.037

Source: own elaboration from EMQ06.
Test: Chi^2 sig = 000 all categories; Adjusted residuals test, corrected.
** Non-significant data, insufficient sample frequency per cell.

3.2. Walking as a mode choice

Living in a vital or non-vital area has profound implications on transport behaviour in general, and particularly on modal choice. Table 4 shows the relationship between the characteristics of the urban area where seniors are living and the use of walking, public transport and private transport, with data being stratified by gender ($p < 0.001$). Overall, the senior population in the RMB is walking for transport for nearly 7 out of 10 journeys (69.8%) ($\chi^2 = 741.916$ $p < 001$). Public transport is used on 17.3% of occasions, leaving private transport to account for 12.9% of trips. The vitality of the urban area appears to be just as relevant in determining all three travel modes. Its effects on walking are particularly strong, as those who live in vital areas are compelled to walk for 76.7% of their trips, 6.9 points higher than the total average. Their counterparts living in non-vital areas are using walking for transportation on only 56.8% of their trips, which means 13 points less than the total average. Also found to be significant, is the utilisation of public and private transport. The use of these means of transport is constantly higher on non-vital areas, to a degree that varies from 13 to 18 percentage points from the total average. The characteristics of the urban area where the trip does take place have nearly identical effects, for either men or women. However, the same gendered differences that can be found throughout other ages are also reproduced in seniors, as men are using private transport more often than women, whether they live in vital or non-vital areas. These gendered differences are slightly stronger in non-vital areas, where women report walking 2 percentage points less than men, but are using private transport 10.2 points less. Also, the effect of the urban environment is stronger in women ($\chi^2 = 432.127$ $p < 0.001$) than in men ($\chi^2 = 330.127$ $p < 0.001$).

3.3. Physical activity and WHO recommendations

It is through this increased ratio of walking journeys, that the urban environment expresses its effect on the overall physical activity of the resident senior population. We have seen how seniors choose to walk for transport more often in vital areas. But, how

Table 4
Modal choice by gender and municipality type.

Gender	Age group	Area type (%)			
		Vital (a)	Non vital (b)	*Total*	Ratio (a/b)
Men	Walking	*75.2*	**55.8**	67.9	1.348
	Public transport	**10.8**	*18.5*	14.5	0.584
	Private transport	**14.0**	*25.7*	17.6	0.545
	Total	100	100	100	1
Women	Walking	*78.1*	**57.8**	71.5	1.351
	Public transport	**15.2**	*26.7*	19.8	0.569
	Private transport	**6.6**	*15.5*	8.8	0.426
	Total	100	100	100	1
Total	Walking	*76.7*	**56.8**	69.8	1.350
	Public transport	**13.1**	*22.8*	17.3	0.575
	Private transport	**10.2**	*20.3*	12.9	0.502
	Total	100	100	100	1

Source: own elaboration from EMQ06.
Test: Chi^2 sig = 000 all categories; Adjusted residuals test, corrected.
Italics: Significantly higher values.
Bold: significantly lower values.
** Non-significant data, insufficient sample frequency per cell.

does this correlate with the actual minutes spent on walking and by extension on their physical activity?

Our main hypothesis was that, living in a vital or non-vital environment created a significant difference, not only on the number of walking trips, but also on the number of minutes invested in walking for transport. In order to test the hypothesis, an independent samples t-test was performed, the results of which were the realisation that the relationship actually existed between variables ($t = 69.12$; $p < 0.001$). Numerically, this relationship can be seen in Table 5. The general trend, as also noted for the number of trips, is that men walk more minutes than women (86.6 vs. 57.7, respectively), and that seniors also do so in comparison with elder seniors (76.4 vs. 63.0, respectively).

Overall, living in a vital environment is equivalent to walking 4.8 more minutes than living in a non-vital environment. Differences, however, are particularly gendered, as the physical activity of men appears to be highly dependent of the vitality of the neighbourhood. For male Seniors (65–74 years of age) the differences can be up to 16 min less a day, although these differences are attenuated on the male Elderly Seniors (>75 years of age) for which there is only a 3 min difference between vital and non-vital neighbourhoods. In contrast, women appear to draw contradictory results.

Following the established link between physical activity, urban vitality and walking for transport, one can relate the characteristics of the neighbourhood with how people perform, in accordance with the WHO physical activity standards. In Table 6, we demonstrate how the different sample subgroups get to the recommended threshold of 30 min walked per day, which would correspond to 30 min of moderate physical activity. As expected, there is a strong statistical significance between achieving the recommended amount of daily physical activity and the area vitality ($\chi^2 = 2005.977$ $p < 0.001$). Numerically, these differences mean that in all the sample groups, those who lived in vital areas were more prone to achieving the recommendations than their counterparts living in non-vital areas. The higher differences can be found in Males, for whom the area vitality can mean a 35.4% difference. Female differences are lower (25.1%), but they consistently fail to achieve the WHO minimums as, even in vital urban areas, only 37.4% of them are walking more than 30 min every day.

Table 6
Percentage of population over 30 min walking by gender, age and area type.

Gender	Age group	Area type (%)			
		Vital (a)	Non vital (b)	Total	Ratio (a/b)
Men	Senior 65–74	*58.4*	**43.6**	51.7	1.339
	Elder senior >75	*48.7*	**36.4**	48.3	1.338
	Total	*54.7*	**40.4**	49.3	1.354
Women	Senior 65–74	*41.1*	**28.2**	39.5	1.457
	Elder senior >75	*33.7*	**31.2**	33.6	1.080
	Total	*37.4*	**29.9**	35.6	1.251
Total	Senior 65–74	*49.2*	**35.6**	43.6	1.382
	Elder senior >75	*39.1*	**33.1**	38.8	1.181
	Total	*44.7*	**34.3**	41.3	1.303
	Population	*277,954*	*136,047*	*414,001*	

Source: own elaboration from EMQ06.
Test: Chi^2 sig = 000 all categories; Adjusted residuals test, corrected.
Italics: Significantly higher values.
Bold: significantly lower values.
** Non-significant data, insufficient sample frequency per cell.

4. Discussion

This study explored whether urban vitality is associated with PA and activity engagement of the elderly. We found that the elderly living in thriving areas are less immobile, take more trips per day, choose walking as a means of transport more often and also walk for more minutes than those who live in non-vital areas.

In contrast with the results of Forsyth et al. (2009), our results clearly demonstrate how the environment has different effects on different social groups, especially in terms of age and gender. The general trend is that the role of the built environment in modifying PA and travel behaviour is exacerbated as age grows, but most importantly, we found that the results were also gender related, as men were more affected by the settings of the built environment than women. The importance of the gender variable among elderly PA remains heavily understudied. Only some studies, such as those by Bauer et al. (2003) and Gregg et al. (2003) examined the specific travel patterns of older women, although not specifically the gender differences with men. In contrast, Hakamies-blomqvist and Siren (2003) did indeed examine gender differences, but only focused on the driving cessation issue.

The results of this study have demonstrated that the lack of urban vitality is consistently found as significant to explain higher immobility cases in the elderly of all ages and gender (see Table 2). Also noteworthy, results have shown that urban vitality does not always mean a low immobility ratio, as there are several other factors at play. As Schwanen and Páez, (2010) suggest, the reduction and cessation of driving, as a result of a decrease on the corporeal capacities, has a significant impact on mobility patterns of elderly (Harrison and Ragland, 2003), especially when a non-walkable urban environment offers no alternatives. In the Barcelona Metropolitan Region 49.8% of people between 65 and 74 years of age still have a driving licence, whereas only 25% of people older than 75 years of age still have one. Besides being a symbol of becoming old, not being able to drive makes elderly become increasingly

Table 5
Average minutes spend on walking by gender, age and area type.

Gender	Age group	Area type			
		Vital (a) (minutes)	Non vital (b) (minutes)	Total (Minutes)	Differences (a–b) (minutes)
Men	Senior 65–74	102.0	86.2	94.0	+15.8
	Elder Senior >75	74.9	71.8	76.4	+3.1
	Total	91.6	80.3	86.6	+11.3
Women	Senior 65–74	61.1	55.5	61.0	+5.6
	Elder Senior >75	51.1	57.6	54.2	−6.5
	Total	56.6	56.6	57.7	0
Total	Senior 65–74	80.8	71.3	76.4	+9.5
	Elder Senior >75	60.7	63.0	63.0	−2.3
	Total	72.1	67.3	70.3	+4.8
	Population	*277,954*	*136,047*	*414,001*	

Source: own elaboration from EMQ06.
Test: Chi^2 sig = 000 all categories; Adjusted residuals test, corrected.
** Non-significant data, insufficient sample frequency per cell.

dependent on the potential of their neighbourhood. That is why the differences between immobility in vital and non-vital environments are exacerbated above the age of 75 years, when car use drops due to age. Our results suggest that immobility numerically affects women more than men, but at the same time reveal that men are more subject to the characteristics of the built environment. These may be in line with the findings of Bauer et al. (2003), as women, who have lived with lower motorisation rates than men, tend to adapt better to life after the car, and are less dependent on the potential of their built environment. Overall, the loss of mobility capacities entails a loss of control over their own lives along with a fear of becoming a burden to families and with losing social capital.

This study has also found that seniors living in vital urban areas are making more trips than those who live in non-vital ones, which means that they are also engaging in more activities (see Table 3). Hence, it can be stated that living in vital urban areas is helping their mental health, as performing more activities has been positively associated by Putnam (2000, p. 328) and Pollack and von dem Knesebeck, (2004) with general health and wellbeing. Results also show that trip frequency decreases with age, both in vital and non-vital areas, as men and women equally reported a drop in their daily trips as they grew older. This findings are in line with those by Giuliano (1999) and, more recently, by Páez et al. (2007) and Petterson and Shmoker (2010). Our results, however, go further and suggest that elderly women take fewer trips than elderly men and also, most importantly, that as in the case of immobility, living in a vital or non-vital area also had a greater effect on trip frequency for men than for women.

The degree upon which these trips are converted onto PA depends on how often the elderly are choosing walking as a means of transport. Walking is 20% more frequent in vital areas than in non-vital areas, which effectively links neighbourhood walkability with actually walking for transport (see Table 4). In all the comparisons between identical seniors (same age and same gender) those who live in vital neighbourhoods report walking more often than those who live in non-walkable neighbourhoods. This is fully consistent with what Villanueva et al. (2014) and McCormack et al. (2014) have recently found in population subgroups of all ages and also what King et al. (2011) found, specifically on population groups above the age of 65 years. This preference for walking in vital environments makes residents in these areas report nearly 5 more minutes of PA every day. In terms of weekly PA, there is a 34-min difference between residents of vital and non-vital areas, which locates our results on the higher range of the 22–40 min span reported by King et al. (2011).

Overall, 41.3% of the elderly in the Barcelona Metropolitan Region reach the WHO recommended 30 min of PA per day. This figure is far better than the one found by Pucher et al. (2011) with respect to the US and also higher than the 28.2% found by Buehler et al. (2011) with respect to Germany. Living in a vital urban environment improves the chances of reaching the WHO threshold, as 44.7% of the seniors inhabiting these areas walk for more than 30 min per day. The fact that urban vitality positively affects PA in all gender and age combinations is encouraging, towards designing public health interventions through urban policy, as actions taken in the urban environment positively affect all mobility habits of the elderly.

Taken globally, these results suggest that the hypothesis upon which urban vitality entails higher physical activity and activity engagement can be fully sustained. Furthermore, these results confirm the hypothesis that living in vital urban environments contributes to building healthy mobility habits, as the proximity to facilities and having people walking on the street encourages the elderly to make more trips which involve walking more often. Finally, it is also interesting to note how gender accounts for more differences than age itself, when most of the literature focuses on the ageing process as the main game changer for elderly mobility. The specific findings on how urban vitality and the settings of the built environment have different effects on men and women, opens future lines of research and may lead to recommending integrating gender on studies of the elderly on a regular basis.

Acknowledgements

The research reported in this paper has been possible thanks to financial support received from the Project CSO2013-42513-P (subprogram GEOG). “Everyday mobility and urban dynamics of proximity. A territorial, social and environmental approach”. The authors would like to thank Dr. Matt Copley for his professional proofreading services and for his editing suggestions. We would also like to thank the reviewers for making a range of very constructive comments, which greatly helped us improve an earlier version of our paper.

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