UNIVERZA V LJUBLJANI
BIOTEHNIŠKA FAKULTETA

Krista MIKLAVEC

VPLIV PREHRANSKIH IN ZDRAVSTVENIH TRDITEV TER SIMBOLOV NA POTROŠNIKOVO IZBIRO ŽIVIL

DOKTORSKA DISERTACIJA

Ljubljana, 2017

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INFLUENCE OF NUTRITION AND HEALTH CLAIMS AND SYMBOLS ON CONSUMER'S FOOD CHOICE

DOCTORAL DISSERTATION

Ljubljana, 2017

Na podlagi Statuta Univerze v Ljubljani ter po sklepu Senata Biotehniške fakultete in sklepa Komisije za doktorski študij Univerze v Ljubljani z dne 13.10.2015 je bilo potrjeno, da kandidatka izpolnjuje pogoje za opravljanje doktorata znanosti na Interdisciplinarnem doktorskem študijskem programu Bioznanosti, znanstveno področje prehrana. Za mentorja je bil imenovan doc. dr. Igor Pravst, za somentorja pa izr. prof. dr. Jurij Pohar.

Doktorska disertacija je zaključek Interdisciplinarnega doktorskega študijskega programa Bioznanosti s področja prehrana na Biotehniški fakulteti Univerze v Ljubljani. Raziskovalno delo je bilo opravljeno na Inštitutu za nutricionistiko v Ljubljani in na University of Surrey (Guildford, Velika Britanija; izmenjava), vključevalo pa se je v izvajanje nacionalnega raziskovalnega programa »Prehrana in javno zdravje« (Programska skupina ARRS P3-0395) in več raziskovalnih projektov, predvsem: »CLYMBOL: Role of health-related claims and symbols in consumer behaviour« (EU FP7, Št. pogodbe 311963); »Prehranske in zdravstvene trditve na živilih« (ARRS V7-1107); in »Simboli na živilih kot orodje potrošnikom za lajšanje izbire zdravju koristnih živil« (ARRS V3-1501).

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AI Namen doktorske disertacije je bil ovrednotiti pogostost pojavljanja prehranskih (PT) in zdravstvenih (ZT) trditev, simbolov in spremljajočih informacij na označbah živil, ovrednotiti seznanjenost in asociacije potrošnikov s simbolom varovalnega živila (SVŽ) ter raziskati vpliv različnih trditev na potrošnikovo izbiro živil. Pojavljanje trditev smo spremljali na osnovi vrednotenja označb predpakiranih živil na tržišču. V prvi raziskavi, ki smo jo izvedli v petih evropskih državah leta 2013, smo pregledali 2034 naključno odvzetih živil; PT smo našli na 21 %, ZT pa na 11 % živil. Leta 2015 smo v Sloveniji izvedli obsežnejšo raziskavo, v katero je bilo vključeno 10.633 živil; s PT je bilo označenih 17 %, z ZT 6 % in SVŽ 1 % živil. Ugotovili smo, da so bili pri večini tako označenih živil navedeni tudi podatki o hranilni vrednosti (HV). Na živilih so se najpogosteje navajale splošne zdravstvene trditve (SZT), ki pa so bile redko (22 %) podkrepljene s specifičnimi ZT. Poleg tega je imelo le 29 % živil, označenih s SZT, na označbi navedeno tudi izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga in podatke o HV. Seznanjenost potrošnikov s SVŽ smo raziskovali s spletno raziskavo (N=1.050). Vprašalnik je bil razdeljen v pet sklopov: socio-demografske karakteristike, metoda asociacije, seznanjenost s simbolom, analiza sestavljenih učinkov (CA) in vrednotenje simbolov na podlagi podanih trditev. Večina v raziskavo vključenih potrošnikov je SVŽ poznala, še zlasti tisti, ki so v gospodinjstvu odgovorni za nakup živil. Pogosto so navedli, da so SVŽ opazili na živilih, analiza asociacij pa je pokazala, da ga največkrat povezujejo z zdravjem. Z uporabo CA metode smo ugotovili pomemben vpliv navajanja pojasnjevalnih trditev ob simbolih na preference potrošnikov; najnižjo delno korist nivoja smo ugotovili, če simbola ni spremljala nobena pojasnjevalna trditev, največjo korist pa z uporabo trditve »Varuje zdravje«. V dodatni raziskavi smo na primeru jogurta, prav tako z uporabo metode CA, vrednotili vpliv različnih trditev na potrošnikovo (N=371) izbiro živil, pri čemer smo poleg trditev variirali tudi vsebnost sladkorja in maščob. Ugotovili smo, da so potrošniki sicer večinoma bolj kot na testirane trditve občutljivi na vsebnost sladkorja in maščob, vendar pa obstoja razmeroma velika skupina potrošnikov, na katero imajo trditve lahko pomemben vpliv (t.i. iskalci trditev). Za zaščito slednjih bi bilo smotrno uporabo trditev omejiti na živila z ugodno hranilno sestavo.

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AB The aim of the dissertation was to evaluate prevalence of nutrition (PT) and health (ZT) claims, symbols and accompanying information on food labels, examine familiarity and associations with "Protective food" symbol (SVŽ) and the influence of different health claims on consumer's food choice. The presence of claims was evaluated based on food labels from pre-packed foods on the market. In the first research that was carried out in five European countries in 2013 we randomly sampled 2034 foods; PT was found on 21%, and ZT on 11% of food products. In 2015 we conducted more extensive research held in Slovenia where we analysed 10633 food products; 17% of which was labelled with PT, 6% with ZT, and 1% with SVŽ. We determined that majority of such food products were also labelled with nutritional declaration (HV). Most commonly found claims on foods were general health claims (SZT) which were rarely (22%) labelled with substantiated ZT. Further, only 29% of foods labelled with SZT also carried a statement indicating the importance of a varied and balanced diet and a healthy lifestyle, and HV. Consumers' familiarity with SVŽ was studied using an online questionnaire (N=1050). The questionnaire consisted of five parts: socio-demographic characteristics, word-association task, symbol recall, conjoint study (CA), evaluation of symbols based on statements provided. Majority of participants recognized SVŽ, especially those who are responsible for grocery shopping in the household. Participants often reported seeing SVŽ on foods, and association analysis showed that they most commonly relate it to health. Using CA, we determined important influence of using a claim along symbol on consumers' preferences; lowest part-worth utility was observed when no claim was present and highest when claim "Protects health" was present. In additional research with yoghurt as a base product, we also used CA to evaluate the influence of different claims on consumers' (N=371) food choice, where we varied claims along with sugar and fat content. We determined that consumers are more sensitive to sugar and fat content rather than to claims, although there is quite a big segment of consumers that could be influenced by claims (so-called claim seekers). To protect this group of consumers, claims should be limited only to foods with better nutritional value.

KAZALO VSEBINE

KAZALO ZNANSTVENIH DEL

KAZALO PREGLEDNIC

KAZALO SLIK

KAZALO PRILOG

OKRAJŠAVE IN SIMBOLI

BTD	blagovne znamke, trgovska in domišljijska imena
CA	analiza sestavljenih učinkov (angl. Conjoint Analysis)
CBC	analiza sestavljenih učinkov, ki temelji na izbiri med več možnostmi (angl. Choice-Based Conjoint)
ER	evropska raziskava
FZT	funkcijske zdravstvene trditve
HV	hranilna vrednost
PT	prehranska trditev
SCP	simbol Choices Programme
SK	simbol ključavnice
SR	slovenska raziskava
SVŽ	simbol varovalnega živila (angl. Protective food symbol)
SZT	splošna zdravstvena trditev
ZT	zdravstvena trditev
ZTO	zdravstvene trditve za otroke
ZTZT	zdravstvene trditve o zmanjševanju tveganja

1 PREDSTAVITEV PROBLEMATIKE IN HIPOTEZE

1.1 PREGLED OBJAV

Prehrana in zdravje človeka sta tesno povezana; način prehranjevanja posameznika lahko deluje bodisi kot dejavnik tveganja za razvoj številnih bolezni, bodisi kot zaščitni dejavnik, ki krepi zdravje in izboljša kakovost življenja (WHO, 2014; Diepeveen in sod., 2013). Prehranske izbire določajo vnos hranil in drugih snovi v telo. Potrošniki si različno razlagajo pojem prehrana in z njo povezane teme, kar lahko vpliva na njihovo izbiro živil (Buckland in sod., 2015; Vlontzos in Duquenne, 2014). Z izbiro živil se potrošniki srečujejo vsakodnevno, pri čemer upoštevajo ceno, blagovno znamko, senzorične lastnosti, hranilno vrednost (HV) živil in številne druge dejavnike, sam proces izbire pa vključuje zapletene odločitvene procese (Finkelstein in Fishbach, 2010; Sanlier in Seren Karakus, 2010).

1.1.1 Nakupno vedenje potrošnikov

Področje vedenja potrošnikov je zelo široko. Vključuje izbiro, nakup in razpolaganje z izdelki, za zadovoljitev potreb in želja. Potrošnika se obravnava kot osebo, ki prepozna svoje želje ali potrebe ter opravi nakup, vključno z njegovim po-nakupnim odnosom do izdelka. Oseba, ki opravi nakup pa ni vedno tista, ki bo izdelek tudi uporabila. Na katerikoli del v procesu odločanja in izbire lahko s svojim mnenjem ali priporočilom vpliva druga oseba (Storm, 2007). Proces odločanja je kompleksen proces, ki ga Solomon (2013) deli na pet stopenj: prepoznavanje potreb, iskanje informacij, ocenjevanje alternativ, nakupna odločitev, in po-nakupno vedenje.

Nakup je pogojen z večjim številom dejavnikov, ki vključujejo stanje potrošnika pred nakupom, kamor sodijo razpoloženje, čas, ki ga ima na razpolago, odnos do nakupovanja, idr. Med potrošniki se pojavljajo tudi pomembne razlike glede preferenc do posameznih atributov izdelka. Kadar potrošniki nakupno odločitev sprejmejo v trgovini, nanjo vplivajo tudi dražljaji in okolje v sami trgovini. Nenazadnje na nakupne odločitve vplivajo tudi navade, saj potrošniki sprejemajo drugačne odločitve, če izdelek predhodno poznajo in ga redno kupujejo, ali če se odločajo za nakup novega izdelka (Beckmann, 2007).

Zadovoljstvo potrošnika z izdelkom je odvisno predvsem od tega ali dosega njegova pričakovanja, ki pa so lahko odvisna od kakovosti izdelka in cene. Na nakup izdelkov v prihodnosti lahko pomembno vpliva ali ima potrošnik po uporabi določenega izdelka pozitivne ali negativne izkušnje (Beckmann, 2007).

Potrošniki imajo pri izbiri izdelka običajno na voljo precej informacij o izdelku, hkrati pa imajo pogosto tudi predhodne izkušnje – bodisi z enakim ali sorodnim izdelkom (Bettman in Park, 1980). Pri nakupu potrošniki vlagajo različno količino truda, saj so nekatere

odločitve pri nakupu zanje pomembnejše od preostalih. V nekaterih primerih proces odločanja poteka avtomatično (hitre odločitve na podlagi manjšega števila informacij), včasih pa gre lahko za dolgotrajen proces, ki pred nakupno odločitvijo vključuje zbiranje in vrednotenje večjega števila informacij. Potrošniki se mnogokrat zanašajo na hevristiko ali praktična pravila, ki jim olajšajo proces odločanja (Solomon, 2013).

Tudi pri izbiri živil gre za dinamičen proces, ki je podvržen stalnim spremembam, na katere vplivajo raznovrstni dejavniki v različnih stopnjah celotnega nakupnega procesa (Köster in Mojet, 2007). Na nakupno odločitev potrošnikov vplivajo tudi različne značnice živil (Loebnitz in sod., 2015; Van der Merwe in sod., 2014).

Kot je bilo že omenjeno Solomon (2013) proces odločanja razvršča v pet stopenj. Iz tega sta izhajala tudi Grunert in Wills (2007), ki sta opredelila tudi štiri glavne dejavnike, ki vplivajo na vseh korakih procesa odločanja pri nakupu živila, in sicer interes potrošnika, znanje, demografske lastnosti in izgled označbe živila.

Podobno kot pri drugih izdelkih, tudi na izbiro živil vpliva zelo veliko različnih dejavnikov. Model odločanja za izbiro živila, ki so ga Sobal in sod. (2006) povzeli po številnih avtorjih, vključuje tri glavne komponente, ki se med procesom odločanja povezujejo:

- Življenjska pot: trenutna izbira živil je odvisna od dejavnikov, ki so se razvili tekom življenja potrošnika, od preteklih izkušenj, bodočih pričakovanj in sprememb tekom življenja. Sem sodijo tudi prehranske navade.
- Različni vplivi, in sicer vpliv bioloških, vedenjskih, psiholoških, kulturnih, ekonomskih, socialnih, geografskih, političnih, zgodovinskih, okoljskih in drugih dejavnikov na zavestno in nezavedno izbiro živil.
- Sistem personalizirane prehrane, ki vključuje racionalno obravnavo parametrov, ki vplivajo na izbiro živil.

Na samo izbiro živil seveda bistveno vpliva tudi dostopnost do posameznih živil. Potrošniki namreč lahko izbirajo le med tistim, kar imajo na voljo (Rozin, 2006).

1.1.2 Označbe živil

Konkurenca med proizvajalci živil je velika, na tržišču pa je znotraj posamezne kategorije živil običajno na razpolago večje število podobnih izdelkov, pri čemer so lahko nekateri bolj, drugi pa manj prehransko ustrezni (Mackison in sod., 2010). Naraščanje ponudbe živilskih proizvodov ter nekatere tehnike uporabljene v trženju otežujejo izbiro potrošnikov in njihove nakupne odločitve (Lahti-Koski in sod., 2012).

Zdrave prehranske navade so ključnega pomena za zmanjševanje tveganj za nastanek kroničnih bolezni. Označbe na živilih naj bi potrošnikom omogočale čim hitrejšo in čim

lažjo izbiro ustreznih živil, lahko pa jim tudi pomagajo identificirati hranilno sestavo živila, kar lahko vpliva na njihove prehranske navade in prehranski status (Cecchini in Warin, 2016; Rayner in sod., 2013; Lahti-Koski in sod., 2012; Vyth in sod., 2010). Vendar imajo v praksi potrošniki mnogokrat težave pri sledenju prehranskim priporočilom (EUFIC, 2009). Oblikovanje ustrezne embalaže in označbe na embalaži živila sodi v eno izmed ključnih faz razvoja živila. Izgled embalaže in označbe pomembno vplivata na uspešnost prodaje proizvoda na tržišču. Označbe na živilih lahko pritegnejo pozornost potrošnikov, hkrati pa zagotavljajo informacije, na podlagi katerih se odločijo za izbiro živila (Ares in sod., 2013; Babio in sod., 2013; Mackison in sod., 2010). Označevanje živil opredeljuje obsežna zakonodaja, pri čemer velja izpostaviti predvsem Uredbo (EU) 1169/2011 o zagotavljanju informacij o živilih potrošnikom. Med obvezne informacije na označbi živila, glede na uredbo, sodijo ime živila, seznam sestavin, alergeni, količina nekaterih sestavin, neto količina živila, datum minimalne trajnosti ali datum uporabe, posebni pogoji uporabe ali shranjevanja, naziv podjetja in naslov nosilca živilske dejavnosti, država izvora ali kraj porekla, navodila za uporabo (kadar je to potrebno), alkoholna stopnja pri alkoholnih pijačah ter od decembra 2016 naprej tudi označba HV živila, ki mora vključevati podatek o energijski vrednosti, količine maščob, nasičenih maščob, ogljikovih hidratov, sladkorjev, beljakovin in soli.

V splošnem imajo potrošniki precej težav z razumevanjem informacij, ki se pojavljajo na označbah živil (Besler in sod., 2012), povečuje pa se tudi delež potrošnikov, ki izgubljajo zaupanje v resničnost teh informacij (Sirieix in sod., 2013). Dvom potrošnikov v resničnost informacij na označbi živila (Svederberg in Wendin, 2011; Niva in Mäkelä, 2007) lahko spremeni njihovo dojemanje živila ter tako poveča kompleksnost njihove odločitve pri nakupu (Fenko in sod., 2016).

V nekaterih primerih potrošniki nepazljivo preberejo informacije na označbah živil, ali pa jih prenašajo s poznanega na nepoznano živilo, kar lahko vodi do posploševanja in nepravilnih sklepanj o lastnostih živila (Draper in sod., 2011; Fullmer in sod., 1991). Poleg tega na pozornost potrošnikov vpliva tudi zgoščenost podatkov na posamezni označbi živila. Rezultati raziskav so npr. pokazali, da večje število elementov na sprednji strani označbe zmanjša pozornost potrošnikov za posamezne elemente (Oliveira in sod., 2016; Bialkova in sod., 2013).

1.1.3 Prehranske in zdravstvene trditve

Na živilih se poleg obveznih informacij pojavljajo tudi različne prostovoljne trditve, ki navajajo, da ima živilo ugodne prehranske ali zdravstvene učinke. Gre za prehranske trditve (PT) in zdravstvene trditve (ZT), ki jih proizvajalci živil lahko uporabljajo v skladu z Uredbo (ES) 1924/2006 o prehranskih in zdravstvenih trditvah na živilih. Uredba definira PT kot vsa sporočila, vključno s slikovno predstavitvijo, grafično predstavitvijo ali predstavitvijo s

simboli v kakršni koli obliki, s katerimi se navaja, domneva ali namiguje, da ima živilo posebej ugodne hranilne lastnosti, medtem ko ZT navajajo, domnevajo ali namigujejo, da obstaja povezava med kategorijo živil, živilom ali eno od njegovih sestavin na eni strani in zdravjem na drugi strani. Na živilih se sme (z nekaterimi izjemami) uporabljati le trditve iz evropskega registra dovoljenih prehranskih in zdravstvenih trditev (EC, 2016), pri čemer morajo proizvajalci upoštevati tudi splošne in posebne pogoje, ki so bili predpisani ob odobritvi posamezne trditve.

Poleg specifičnih (odobrenih) PT in ZT, je na označbah živil dovoljeno uporabljati tudi nespecifične trditve. Trditve, ki se navezujejo na splošne, ne posebej opredeljene prednosti, ki jih ima hranilo ali živilo za splošno dobro zdravje ali z zdravjem povezano dobro počutje, razvrščamo med splošne zdravstvene trditve (SZT), uporabljati pa se jih sme le, če se jih na označbi pojasni s povezano odobreno specifično ZT. Blagovne znamke, trgovska ali domišljijska imena (BTD), ki se uporabljajo pri označevanju živil, lahko v določenih primerih ravno tako uvrščamo med PT ali ZT. Tudi simbole, s katerimi proizvajalci označujejo živila z ugodnejšo hranilno sestavo ali posebnimi koristmi za zdravje, uvrščamo med PT oz. ZT.

Pri razvoju novih živil je potrebno predhodno razmisliti tudi o uporabi trditev, saj mora sestava in označba živila ustrezati določenim zahtevam - tako z vidika zakonodajnih omejitev, kot z vidika zagotavljanja ustrezne informiranosti potrošnika. Vsako navedbo ZT morajo namreč spremljati obvezni podatki, ki dajejo potrošnikom potrebne informacije o lastnostih živila in s tem omogočajo informirano izbiro živila. Z namenom zagotavljanja visoke ravni varstva potrošnikov in oblikovanja enakih konkurenčnih pogojev za prehrambno industrijo tudi to področje urejajo enotni evropski predpisi, predvsem Uredba (EU) 1924/2006.

Uporaba PT in ZT na označbah živil je razmeroma pogosta. Raziskava opravljena na Irskem v letu 2007 je pokazala, da je približno 47 % živil označenih s PT in 18 % z ZT (Lalor in sod., 2010). Rezultati popisa izbranih skupin živil opravljenega med leti 2008 in 2009 v 27-ih državah EU in Turčiji, so pokazali, da je bilo povprečno 25 % živil označenih s PT in 6 % z ZT, pri čemer so bile zaznane precejšnje razlike med različnimi državami (Storcksdieck genannt Bonsmann in sod., 2010). Tudi v ZDA je uporaba PT precej pogostejša v primerjavi z ZT; v obdobju 2000-2001 je bilo s PT označenih okoli 50 %, z ZT pa 5 % živil (Legault in sod., 2004). Kasnejša raziskava je pokazala nekoliko manj pogosto označevanje živil s PT (40 %) in pogostejšo z ZT (9 %) (Colby in sod., 2010). V Kanadi je bil delež živil označenih s PT 46 %, označevanje z ZT pa ni bilo raziskano (Schermel in sod., 2013). Nasprotno je bilo v Avstraliji in Novi Zelandiji raziskano le označevanje živil z ZT, in sicer so bile slednje v letu 2003 prisotne na 15 % živil, od tega jih 5 % ni bilo skladnih z zakonodajo (Williams in sod., 2006). Za Kitajsko so razpoložljivi le podatki o pogostosti prisotnosti PT, in sicer so se leta 2008 le te pojavljale na 12 % živil (Lv in sod., 2011). V Sloveniji so se leta 2011 ZT

nahajale na 13% živil (Pravst in Kušar, 2015). Pri tem je potrebno upoštevati, da so bile različne raziskave izvedene z vključitvijo različnih kategorij živil in z različnimi metodami in definicijami PT in ZT.

Rezultati raziskav kažejo, da se pogostost navajanja različnih trditev in simbolov med kategorijami živil zelo razlikuje (Lalor in sod., 2010; Storcksdieck genannt Bonsmann in sod., 2010). Rezultati raziskave, izvedene v 27-ih evropskih državah in Turčiji, so pokazali, da so trditve zelo pogosto prisotne na žitih za zajtrk in jogurtih (Storcksdieck genannt Bonsmann in sod., 2010). Na Irskem je bil delež PT najvišji na žitih za zajtrk in zmrznjenem sadju in zelenjavi, medtem ko je bil delež ZT najvišji pri jogurtih in jogurtnih napitkih (Lalor in sod., 2010). Rezultati raziskave izvedene v Sloveniji so pokazali, da so bili z ZT najpogosteje označeni jogurti in njihovimi nadomestki, žita za zajtrk, rastlinska olja, čaji, masla in namazi ter sadni sokovi (Pravst in Kušar, 2015).

Reakcija potrošnikov na trditve na živilih je odvisna od njihovega razumevanja trditve in povezanosti trditve s hranilom in živilom (Krutulyte in sod., 2011; Verbeke, 2010) ter razumevanja in interpretacije trditve (Carrillo in sod., 2012; Draper in sod., 2011; Fullmer in sod., 1991), kar je odvisno od socio-demografskih karakteristik, znanja o prehrani, poznavanja živila, načina prikaza na označbi in uporabljene terminologije (Nocella in Kennedy, 2012; Grunert in sod., 2010; Cowburn in Stockley, 2005). Nerazumljivi izrazi na označbi živila lahko negativno vplivajo na potrošnikovo izbiro živila (Brunsø in sod., 2002). Potrošniki se morajo pri razlagi z zdravjem povezanih informacij zanašati na razpoložljive informacije na označbi, kot tudi na njihovo znanje in sposobnost razlage teh informacij (Lahteenmaki, 2015). Pri tem so lahko še posebej pomembne informacije o HV živila, zlasti podatki o količini hranil, ki jih potrošniki dojemajo kot nezaželena (Hoefkens in sod., 2011).

Potrošnikova nakupna odločitev je odvisna tudi od načina predstavitve informacije oz. trditve na označbi živila. Potrošniki, seznanjeni z novo informacijo v kognitivnem procesu, novo informacijo povežejo z že obstoječo. Na osnovi tega lahko v nekaterih primerih sklepajo, da ima živilo lastnosti, ki jih trditev ne zagotavlja (Grunert in sod., 2011). ZT lahko vključujejo tudi strokovne izraze, s katerimi potrošniki niso vedno seznanjeni in zato ne razumejo sporočilnosti trditve, kar lahko povzroči kognitivno pristranskost, ki se lahko odraža kot (Roe in sod., 1999):

- pristranskost, kjer potrošnik živilo oceni drugače le zaradi prisotnosti trditve,
- »halo« učinek, kjer prisotnost trditve povzroči, da potrošnik živilo oceni na podlagi drugih parametrov, čeprav v trditvi niso omenjeni,
- »magic-bullet« učinek, kjer potrošnik živilu pripisuje neustrezne lastnosti.

Kot možna rešitev navedenih težav, ki jih imajo potrošniki pri razumevanju in vrednotenju informacij na označbah živil, so lahko tudi poenostavljeni prikazi informacij na sprednji strani označb živil (Sonnenberg in sod., 2013). Rezultati nekaterih raziskav kažejo, da lahko

tovrstne informacije na sprednji strani embalaže povečajo pozornost potrošnikov in jih celo spodbudijo k iskanju dodatnih informacij, ki niso navedene na sprednji strani živila (Becker in sod., 2015). Poleg tega, pa je Talati s sod. (2017) ugotovil, da lahko oznake na sprednji strani označbe zmanjšajo kognitivno pristranskost, ki jo povzročijo ZT. Učinkovitost sporočila na sprednji strani embalaže je odvisna tudi od osebnega interesa potrošnika za ohranjanje lastnega zdravja in od tega, kako zdravo sem mu zdi živilo samo po sebi (Bialkova in sod., 2016). To nakazuje, da je pri obravnavi označb živil potrebno upoštevati tudi kategorijo živil (Verain in sod., 2016).

1.1.4 Simboli na živilih

Enostavni elementi na označbah živil, kamor sodijo tudi preprosta sporočila povezana s prehrano in zdravjem, v besedni ali slikovni obliki, omogočajo hitrejšo izbiro hranilno bolj ustreznih živil (Van Herpen in Van Trijp, 2011). Raziskave so pokazale, da imajo potrošniki raje preproste trditve (Bitzios in sod., 2011) in simbole (Andrews in sod., 2011; Feunekes in sod., 2008), ter da po živilih označenimi s tovrstnimi elementi posegajo tudi potrošniki, ki sicer ne posvečajo pretirane pozornosti izbiri zdravju koristnejših živil (Vyth in sod., 2010).

Slika ima za potrošnika spodbudno vlogo, lahko mu nudi tudi neko predstavo, ki vpliva na njegovo razmišljanje, razlaganje in preference povezane s sliko (Schroeder, 2002). Raziskovanje potenciala simbolov, kot pomoč pri poenostavitvi kompleksnih informacij, je postalo pomemben del raziskav povezanih s hrano in prehrano, saj lahko takšni elementi vplivajo na potrošnikovo izbiro živil in prehranske navade (IoM, 2012). Carrillo in sod. (2014) poročajo, da so simboli na označbi živila potrošnikom pogosto bolj pomembni kakor zapisane informacije. Poleg tega raziskave kažejo, da je za razumevanje neverbalnih simbolnih znakov potreben minimalen kognitiven napor (DeRosia, 2008; Fitzsimons in sod., 2002), saj poenostavljene označbe na živilih predstavijo kompleksne prehranske informacije bolj neposredno in v lažje razumljivi obliki (Sonnenberg in sod., 2013). V kolikor želimo, da je živilo pri potrošniku zaradi uporabljenega simbola prepoznano kot hranilno bolj ustrezno, je potrebno simbol potrošniku ustrezno predstaviti, saj mu le to zagotavlja sporočilnost. Simboli običajno neposredno ne kažejo, da je izdelek bolj zdrav, temveč služijo kot izstopajoč element, ki vpliva na potrošnikovo dojemanje živila (Chrysochou in Grunert, 2014).

V preteklih letih so se v različnih državah že začeli uporabljati simbolni elementi, ki potrošnikom pomagajo vrednotiti hranilno sestavo živila. V nekaterih primerih simbol predstavlja poenostavljen povzetek ključnih prehranskih informacij, značilnih za posamezno živilo, v drugih pa označuje, da živila izpolnjujejo določene predhodno postavljene kriterije (Latortue in Weber, 2010). Tovrsten način označevanja živil s simboli je začel nastajati pod okriljem različnih združenj za zdravje srca, kasneje pa so se v sheme označevanja živil s simboli začeli vključevati tudi proizvajalci živil. Prvi tovrstni simbol, ki se uporablja na

sprednji strani embalaže, je bil simbol vodič srca (angl. Heart guide symbol), ki je nastal pod okriljem Ameriškega združenja za srce (angl. American Heart Association) v letu 1987 (IoM, 2012). Tudi v Evropi so bili razviti različni tovrstni simboli, in sicer švedski simbol ključavnice (angl. Keyhole symbol (SK)) leta 1989 (Neuman in sod., 2014), finski simbol srca (angl. Finnish Heart symbol) leta 2000 (Lahti-Koski in sod., 2012) in simbol Choices Programme (SCP) leta 2006 (Van der Bend in sod., 2014; Vyth in sod., 2010). V Sloveniji se je leta 1992 pod okriljem Društva za zdravje srca in ožilja začel uporabljati simbol varovalnega živila (SVŽ), poznam pod sloganom »Varuje zdravje« (Pokorn, 2005; Jan, 2000). Leta 2011 je bil SVŽ prisoten na 2 % predpakiranih živil v Sloveniji (Pravst in Kušar, 2015).

Glede uporabe simbolov ali drugih dodatnih elementov na označbah živil je potrebno omeniti, da morajo biti vsakršne novosti na izdelkih uvedene previdno, diskretno in brez drastičnih sprememb, saj potrošniki ne želijo hitrih sprememb (Finkelstein in Fishbach, 2010). Dosedanje raziskave na področju simbolov so bile osredotočene predvsem na ocenjevanje zdravstvenih simbolov (Emrich in sod., 2014; Emrich in sod., 2012), seznanjenosti z njimi (Neuman in sod., 2014; Lahti-Koski in sod., 2012; Vyth in sod., 2010; Vyth in sod., 2009) in vpliva simbolov na potrošnikovo izbiro ali dojemanje, kako zdravo je s simbolom označeno živilo (Bialkova in sod., 2014; Van Herpen in sod., 2014; Roberto in sod., 2012; Van Herpen in sod., 2012; Van Herpen in van Trijp, 2011; Steenhuis in sod., 2010), zelo malo pa se jih je osredotočilo na potrošnikove asociacije, povezane s simbolom (Carrillo in sod., 2014; Neuman in sod., 2014).

1.1.5 Izbira hranilno bolj ustreznih živil

Pri spodbujanju zdravega prehranjevanja imajo pomembno vlogo tudi proizvajalci živil, saj so izbire potrošnikov odvisne od razpoložljivosti hranilno bolj ustreznih živil. Povečan interes proizvajalcev, da začnejo proizvajati tovrstna živila je posledica pritiska javnosti in povpraševanja potrošnikov po takšnih živilih (Lahteenmaki, 2013). Vsaj del potrošnikov je namreč vedno bolj pozoren na izbiro hrane in na vpliv, ki jo ima le ta na njihovo zdravje (Lalor in sod., 2011). Kot znamenje, da je podjetje družbeno odgovorno, je tudi skrb za zdravje prebivalstva (Lahteenmaki, 2013), ki se lahko odraža v ponudbi zdravju koristnejših živil.

ZT na živilih lahko potrošnikom pomagajo razumeti povezavo med živilom in zdravjem, sočasno pa lahko v splošnem podpirajo zdrave prehranske navade in posledično vplivajo na izboljšanje javnega zdravja (Skubisz, 2017; Leathwood in sod., 2007), vendar pa je to odvisno tudi od osebnega interesa potrošnikov, dojemanja trditev ter koristi, ki naj bi jo živilo nudilo potrošnikom (Contini in sod., 2015; Dean in sod., 2012). Potrošniki namreč različno ocenjujejo kako zdravi so izdelki označeni s trditvami, razlikujejo pa se tudi v tem, kakšen pomen imajo na njihovo izbiro drugi dejavniki, npr. cena in blagovna znamka izdelka

(Annunziata in Vecchio, 2013). Poleg tega na uporabo različnih trditev na živilih vplivajo tudi demografske karakteristike potrošnikov (Ares in sod., 2009).

Trženje živil je lahko osnovano na različnih skupinah potrošnikov, saj se le ti razlikujejo glede na odnos do zdrave prehrane. Uporaba PT in ZT potrošnikom nudi informacijo o določenih koristnih lastnostih živila, ki so znanstveno potrjene. V primeru, da živilo ne bi bilo označeno s PT ali ZT, bi te koristi potrošnikom lahko ostale skrite (Van Trijp in Van der Lans, 2007). Tovrstne informacije pa sočasno tekmujejo za potrošnikovo pozornost z drugimi informacijami, ki so povezane s potrošnikovim dojemanjem, kako zdravo je neko živilo (Lahteenmaki, 2013). Tipičen takšen primer so oznake ekološko pridelanih živil, saj potrošniki slednja dojemajo kot bolj zdrava od konvencionalne alternative (Chrysochou in Grunert, 2014; Magnusson in sod., 2003).

Rezultati dosedanjih raziskav so pokazali različne vplive ZT na nakupne odločitve potrošnikov. Nekatere raziskave so pokazale povečano verjetnost za nakup živila ob prisotnosti ZT (Aschemann-Witzel in sod., 2013; Tuorila in Cardello, 2002), druge pa niso ugotovile takšne povezave (Orquin in Scholderer, 2015; Legault in sod., 2004; Brecher in sod., 2000). Izbiranje tovrstnih živil je vsekakor kompleksen proces in poleg same trditve odvisen tudi od narave živila in parametrov, na katero se nanaša trditev, zato rezultatov raziskav ni mogoče posploševati. Pred vplivi na zdravje lahko prevladajo tudi drugi dejavniki pri izbiri živil. Sabbe in sod. (2009) so npr. pokazali, da pri nakupu sokov potrošniki več pozornosti namenijo senzoričnim lastnostim, kot pa ZT. Izkazalo se je tudi, da je pri potrošnikih, ki jim je bolj pomembna zdrava prehrana, večja verjetnost, da kljub slabšim senzoričnim lastnostim, raje izberejo bolj zdravo alternativo živila (Visschers in sod., 2010), vendar pa so večini potrošnikom senzorične lastnosti živila pomembnejše kot živilo s hranilno ugodnejšo sestavo (Verbeke, 2006). Pri uvajanju novega živila z ZT na trg, je potrebno upoštevati tudi skupino živil kamor izdelek sodi (ali se uvršča med tista s hranilno bolj ali manj ugodno sestavo), saj tudi ta vpliva na oblikovanje potrošnikovega celokupnega vtisa o živilu (Sabbe in sod., 2009). Upoštevati je potrebno tudi, da se potrošniki razlikujejo po kognitivnih stilih, kar se odraža v tem, kako bodo predelali informacije na označbah, ki bodo vplivale na njihovo odločitev pri izbiri (Mawad in sod., 2015).

Pri nakupu živil se potrošniki mnogokrat zanašajo na navade, izkušnje ali predhodna vedenja, pogosto ne prebirajo označb na živilih ali pa prebranih informacij ne razumejo (Pothoulaki in Chryssochoidis, 2009). Večji vpliv trditev je pričakovati pri potrošnikih, ki imajo nasploh pozitiven odnos do prehranskih in zdravstvenih informacij na živilih (Hellyer in sod., 2012) ter pri potrošnikih, ki so bolje seznanjeni s funkcionalnimi živili oz. njihovimi sestavinami (Verbeke in sod., 2009).

V primerjavi z besedilnimi trditvami imajo lahko prehranski oz. zdravstveni simboli močnejši vpliv na vrednotenje živila s strani potrošnikov – tako z vidika nakupnih odločitev, kot z vidika ocenjevanja, kako zdravo je posamezno živilo (Chrysochou in Grunert, 2014), še posebej, če je potrošnik predhodno seznanjen, kaj sporočajo takšni elementi. Pri trženju hranilno bolj ustreznih živil je zato smotrno poleg ZT uporabljati tudi vizualne elemente (Chrysochou, 2010). Omeniti je potrebno, da je pri tem zelo pomembna tudi izbira in način predstavitve vizualnega elementa. Slokanova (2016) je npr. na več različnih kombinacijah ZT in vizualnih elementov ugotovila, da prisotnost z ZT vsebinsko povezane slike potrošnikom sicer lahko pomaga pri zaznavi koristnih učinkov izdelka, ne vpliva pa nujno na njihove nakupne odločitve.

Ugotovljeno je bilo, da potrošniki hrano dojemajo zelo različno, in sicer nekaterim služi zgolj kot nujna potreba, medtem ko ji drugi dajejo veliko večji pomen; družbena predstavitev lahko tako potrošniku omogoči, da novo živilo dobi nek pomen, ki se odraža v različnih nakupnih odločitvah (Bartels in Onwezen, 2014). Družbena predstavitev namreč zajema vrednote, ideje, prepričanja in prakse, ki jih imajo posamezniki v skupinah ali skupnostih (Moscovici, 2001). Bäckström s sod. (2004) je kot primer pri izpostavitvi potrošnikov novim živilom ter sprejemanju in razumevanju le teh, pri družbeni predstavitvi predstavil sledeče dimenzije: nezaupanje novitetam, upoštevanje tehnologije, upoštevanje ali je živilo naravno, uživanje hrane zaradi užitek in uživanje hrane zaradi nuje.

Odločitve pri izbiri živil pa so velikokrat povezane z individualnimi izbirami potrošnikov, kjer ima velik vpliv družbeno okolje (König in sod., 2017; Bartels in Onwezen, 2014), kar je lahko posledica družbene identitete, ki je definirana kot zavedanje posameznika, da pripada določeni skupini s katero se identificira (Hewstone in Jaspars, 1984). Identifikacija posameznika s skupino namreč lahko do neke mere prispeva k temu, da družbena skupina vpliva nanj in njegove odločitve (König in sod., 2017).

Raziskave so pokazale, da so vplivi PT in ZT, na dojemanje potrošnikov ali so tovrstna živila zdrava, relativno majhni, vendar so lahko pri posameznih skupinah ti vplivi bistveno večji (Van Trijp in Van der Lans, 2007). Pri testiranju razumevanja ZT je posebno pozornost potrebno usmeriti k potrošnikom s pozitivnim odnosom do funkcionalnih živil (Grunert in sod., 2011), saj je pri njih pričakovati večji vpliv trditev na izbiro. Upoštevati je potrebno tudi, da različni tipi trditev na potrošnike vplivajo različno, pri čemer pa je sam način zapisa trditve manj pomemben kot korist, ki je izpostavljena s takšno trditvijo, iz česar lahko sklepamo, da so potrošniki odprti za različne formulacije trditev (Van Trijp in Van der Lans, 2007).

1.1.6 Segmenti potrošnikov

Potrošniki imajo različno (pogosto omejeno) sposobnost procesiranja vseh informacij (Jacoby in sod., 1974), ko se odločajo za nakup živila, in se zato pogosto zanašajo na lastno intuicijo (Ares in sod., 2014). Nakupne odločitve potrošnikov so zato odvisne tudi od njihovih karakteristik, ne le od razpoložljivih informacij in okolja; še posebej pomembne so izkušnje z izdelkom v preteklosti, saj le te vpliva na način procesiranja informacij (Bettman in Park, 1980).

Kljub zgoraj omenjeni potrošnikovi razmeroma omejeni sposobnosti procesiranja informacij na označbah živil, velik delež potrošnikov označbe živil dojema kot kredibilen vir informacij ter navaja, da se jih poslužuje za orientacijo pri izbiri živil (Goodman in sod., 2011). Nedavna raziskava v Sloveniji je sicer pokazala, da 26 % potrošnikov ne zaupa PT in ZT na živilih, zaupanje vanje pa jih je izrazilo 30 % (ostali se niso mogli opredeliti). Približno 43 % v to raziskavo vključenih potrošnikov je tudi izrazilo, da pri nakupu živil spremlja ZT in simbole, 50 % pa jih spremlja PT; skoraj polovica sodelujočih je bila mnenja, da prisotnost PT in ZT ter z zdravjem povezanih simbolov omogoča lažjo in hitrejšo izbiro živil z ugodnejšo hranilno sestavo (23 % se jih s tem ni strinjalo) (Slokan, 2016).

Pogostejše spremljanje označb živil je možno zaslediti pri posameznikih, ki imajo posebne prehranske potrebe, ki so posledica bolezenskih stanj (Campos in sod., 2011) ter pri posameznikih, ki se zdravo prehranjujejo (Stran in Knol, 2013; Hess in sod., 2012; Petrovici in sod., 2012). Potrošniki, ki zdravju namenjajo večjo pozornost, pogosteje pregledajo večje število prehranskih informacij na označbi živila, medtem ko se potrošniki, ki zdravju ne namenjajo toliko pozornosti, običajno osredotočajo le na trditve (Cavaliere in sod., 2016). Spremenjena hranilna sestava, ki se izpostavlja s PT (npr. nizka energijska vrednost, brez sladkorja, vir kalcija …), je lahko še posebej v interesu tistim potrošnikom, ki dajejo večji pomen posameznim hranilom v živilih. Po drugi strani, pa ZT na živilih pritegnejo skupino potrošnikov, ki jih bolj zanima neposredna povezava med živilom in zdravjem. Nekatere raziskave kažejo še, da ženske in starejši kažejo večjo naklonjenost PT in ZT kot moški in mlajši segmenti populacije (Cavaliere in sod., 2016).

Omeniti pa je potrebno, da obstaja razmeroma visok delež potrošnikov, ki označbam ne namenjajo pozornosti (Grunert in sod., 2010), pri čemer kot najpogostejše razloge za to navajajo pomanjkanje časa (Žeželj in sod., 2012), velikost tiska na označbi, nerazumevanje izrazov ter zaskrbljenost glede ustreznosti informacij na živilu (Fenko in sod., 2016; Signal in sod., 2008; Cowburn in Stockley, 2005; Verbeke, 2005).

Zaradi razlik med potrošniki pri pregledovanju in razumevanju označb, je zlasti za proizvajalce in raziskovalce pomembna tudi segmentacija potrošnikov, s katero se lahko

ugotovi ali imajo potrošniki homogene potrebe, odnose in vedenja, ko so izpostavljeni različnim informacijam na živilih (Souiden in sod., 2013; Grover in Srinivasan, 1987).

1.2 NAMEN RAZISKAVE IN HIPOTEZE

1.2.1 Namen raziskave

Namen raziskav je bil:

- Preučiti pogostost uporabe PT in ZT ter simbolov na označbah predpakiranih živil znotraj različnih kategorij živil.
- Določiti pri kolikšnem deležu živil, označenih s SZT, je na označbi živila navedena specifična ZT, izjava o pomembnosti pestre in uravnotežene prehrane ter zdravega življenjskega sloga in HV živila.
- Preučiti seznanjenost odrasle populacije s prehranskimi in zdravstvenimi simboli, predvsem s pri nas najbolj uveljavljenim SVŽ ter raziskati asociacije potrošnikov, ki so povezane s tem simbolom.
- Na primeru sadnih jogurtov raziskati, kako različne trditve v povezavi s prisotnostjo različnih količin nezaželenih hranil vplivajo na potrošnikovo izbiro.

Tovrstne raziskave so pomembne za boljše razumevanje odločitev prebivalcev pri nakupu in uživanju živil. S tem lahko pripomorejo k učinkovitejšim ukrepom za njihovo spremembo. Poleg pomena za znanost na področju prehrane in javnega zdravja so tovrstne raziskave pomembne tudi za področje živilske tehnologije, saj podpirajo razvoj novih inovativnih živil, ki bodo v večji meri izpolnjevala potrebe in pričakovanja potrošnikov, hkrati pa podpirala širše družbene cilje na področju zagotavljanja zdravja prebivalstva.

1.2.2 Raziskovalne hipoteze

Hipoteza 1:
Večina živil na tržišču, na katerih so prisotne splošne zdravstvene trditve, ni označenih s podatki o hranilni vrednosti živila in izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga.

Hipoteza 2:
Segment potrošnikov, ki pozna simbol varovalnega živila, ga v večjem deležu povezuje z zdravjem oz. zdravim življenjskim slogom.

Hipoteza 3:
Pri izboru živil so potrošniku pomembnejše informacije o vsebnosti nezaželenih hranil kot zdravstvene trditve na živilu.

2 ZNANSTVENA DELA

2.1 OSTALO POVEZOVALNO ZNANSTVENO DELO

2.1.1 Prisotnost prehranskih in zdravstvenih trditev ter simbolov na živilih

2.1.1.1 Uvod

Označbe živil morajo biti skladne z Uredbo (EU) 1169/2011 o zagotavljanju informacij o živilih potrošnikom, v kolikor se na njih pojavljajo tudi PT ali ZT, pa morajo biti usklajene tudi z Uredbo (ES) 1924/2006 o prehranskih in zdravstvenih trditvah na živilih. Kot je bilo že predhodno omenjeno, navedena Uredba in z njo povezani zakonodajni dokumenti predpisujejo pogoje za uporabo tovrstnih trditev. V prvi vrsti morajo biti izpolnjeni sledeči osnovni pogoji:

- dokazan ugodni hranilni in fiziološki učinek za snov, na katero se nanaša trditev;
- snov, na katero se nanaša trditev, mora biti v živilu prisotna v količini, ki zagotavlja zatrjevani hranilni ali fiziološki učinek;
- snov mora biti v živilu prisotna v takšni (biološko razpoložljivi) obliki, da jo telo lahko uporabi;
- pričakovana količina zaužitega izdelka mora vsebovati znatno količino hranila ali druge snovi, na katero se trditev nanaša;
- potrošnik mora razumeti trditve na živilih ter biti primerno zaščiten pred zavajajočimi trditvami;
- zaradi možnega vpliva trditev na živilih na prehranske navade in skupno količino zaužitih hranil, morajo imeti potrošniki na razpolago podatke o HV živila.
- v kolikor je na označbi prisotna PT ali ZT, mora biti potrošniku na razpolago tudi informacija o količini v živilu vsebovanega hranila oz. druge snovi, na katero se trditev nanaša.

PT so dovoljene le, če se uporabljajo v skladu s splošnimi in posebnimi pogoji, določenimi z Uredbo (ES) 1924/2006. Splošni pogoji so navedeni v sami Uredbi, predvsem v 5. členu, posebni pogoji za posamezne trditve pa v Prilogi uredbe (Prehranske trditve in pogoji, ki veljajo zanje).

Podobno je dovoljena le uporaba takšnih ZT, ki so v skladu z Uredbo (ES) 1924/2006 ter so vključene v seznam dovoljenih ZT (EC, 2016) (izjema so nekatere predlagane ZT, ki so še v postopku obravnave, npr. ZT za rastline in rastlinske dele (Kušar in Pravst, 2014)). Uredba (ES) 1924/2006 razlikuje med različnimi vrstami ZT. Specifične ZT razdelimo na:

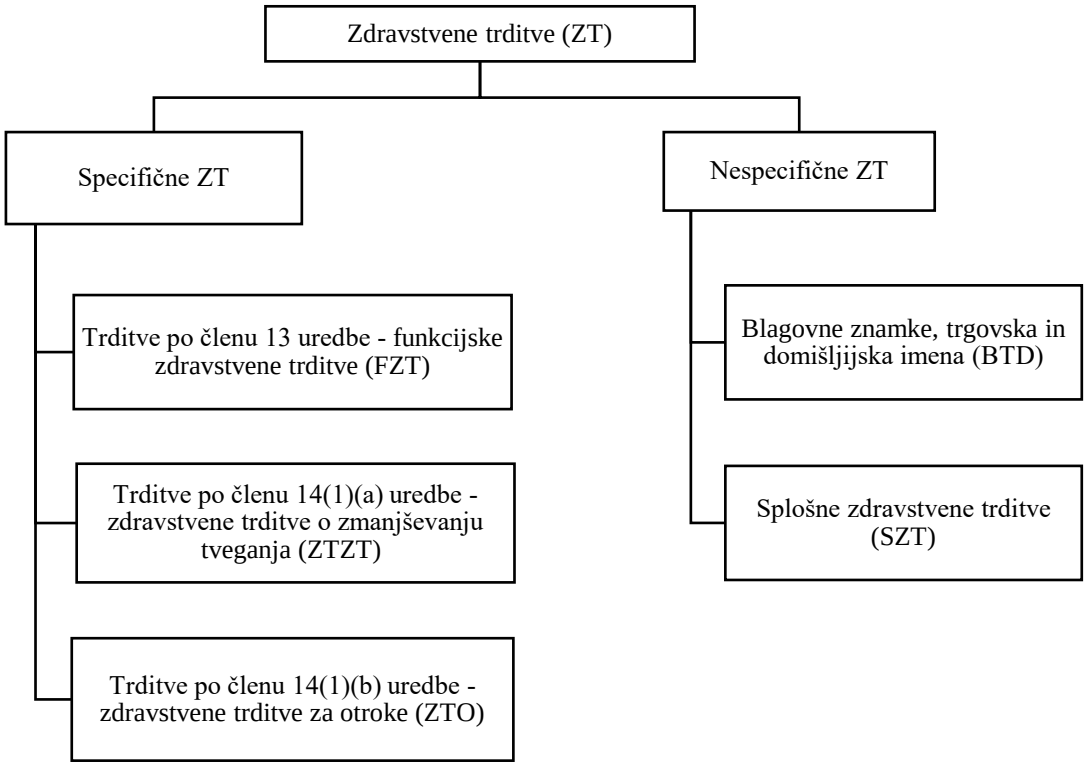
- ZT, ki ne zadevajo zmanjšanja tveganja za bolezni, ter trditve v zvezi z razvojem in zdravjem otrok (trditve po členu 13 uredbe, v nadaljevanju funkcijske zdravstvene trditve (FZT));

- ZT v zvezi z zmanjšanjem tveganja za bolezen (trditve po členu 14(1)(a) uredbe, v nadaljevanju zdravstvene trditve o zmanjševanju tveganja (ZTZT));
- ZT v zvezi z razvojem in zdravjem otrok (trditve po členu 14(1)(b) uredbe, v nadaljevanju zdravstvene trditve za otroke (ZTO)).

Poleg tega morajo biti pri tovrstnem označevanju na živilu navedeni še sledeči podatki: izjava, ki navaja pomembnost raznolike in uravnotežene prehrane ter zdravega načina življenja; količina živila in zahtevan vzorec uživanja, ki je potreben za zatrjevani ugodni učinek; kjer je potrebno, pa tudi izjava, ki je naslovljena na osebe, ki se morajo izogibati uživanju živila; in opozorilo na živilih, ki lahko ob pretiranem uživanju predstavljajo nevarnost za zdravje. Dodatno mora biti pri trditvah, ki navajajo zmanjšanje tveganja za razvoj bolezni, pri označevanju podana tudi izjava, da za bolezen na katero se nanaša trditev, obstaja več dejavnikov tveganja, pri čemer ima lahko sprememba enega od teh dejavnikov ugoden vpliv.

Posebna skupina ZT so tudi nespecifične trditve. Mednje uvrščamo SZT, ki se navezujejo na splošne, ne posebej opredeljene lastnosti, ki jih ima hranilo ali živilo za splošno dobro zdravje, pa tudi BTD, kadar se jih lahko razlaga kot ZT. Pri označevanju živil z nespecifičnimi trditvami, mora biti živilo označeno tudi z vsebinsko povezano specifično ZT, ki je vključena v seznam dovoljenih ZT. Razvrstitev ZT, glede na uredbo (ES) 1924/2006, je shematično prikazana na sliki 1.

Med PT in ZT, upoštevajoč definicijo, uvrščamo tudi vizualne elemente. Poseben primer takšnih elementov predstavljajo simboli, ki se na živilih uporabljajo za izpostavitev posebnih prehranskih prednosti živila oz. ugodnega vpliva na zdravje. Primer tovrstnega simbola, ki se najpogosteje uporablja v Sloveniji, je SVŽ. Pravico do uporabe simbola na posameznem živilu podeljuje Društvo za zdravje srca in ožilja Slovenije. Simbol se podeljuje na osnovi vloge proizvajalca, in sicer za živila, ki ustrezajo določbam Pravilnika o pogojih podeljevanja pravice do uporabe kolektivne blagovne/storitvene znamke Društva za zdravje srca in ožilja Slovenije (Društvo za zdravje srca in ožilja Slovenije, 2007). Živila, ki imajo odobritev za uporabo simbola na označbi v obliki stiliziranega srčka, morajo imeti izpostavljeno tudi lastnost živila, na osnovi katere je bil simbol pridobljen (Pokorn, 2005). V praksi gre za navedbo ene izmed izbranih dovoljenih PT.



Slika 1: Razdelitev zdravstvenih trditev glede na Uredbo (ES) 1924/2006
Figure 1: Classification of health claims in accordance with Regulation (EC) 1924/2006

2.1.1.2 Metode

Uporabili smo podatke zbrane v bazi predpakiranih živil, ki smo jo pripravili na podlagi popisa živil. Popis smo s soglasjem trgovcev opravili v Ljubljani, v dveh hipermarketih, dveh supermarketih in v eni diskontni trgovini. Baza (N = 10.633) je zajemala podatke o vseh predpakiranih živilih znotraj posamezne kategorije, ki so bila na prodajnih policah v času popisa (januar-februar 2015).

Živila so bila razvrščena v kategorije po Dunfordovi (Dunford in sod., 2012): pijače; kruh in pekovski izdelki; žita in žitni proizvodi; slaščice; pred-pripravljena živila; mlečni izdelki; jedilna olja in emulzije; jajca; ribe in ribji izdelki; živila za posebne prehranske namene; sadje in zelenjava; meso in mesni izdelki; prigrizki; omake in namazi; ostalo. Embalaže vseh živil so bile v celoti fotografirane, kar je omogočilo pripravo baze v katero so bili za vsako živilo vneseni vsi podatki, ki so bili predstavljeni ali zapisani na embalaži.

Ovrednotili smo pogostost pojavljanja PT in ZT ter simbolov znotraj posamezne kategorije predpakiranih živil in preverjali, ali na živilih splošne ZT spremljajo druge informacije, ki potrošniku omogočajo informirano izbiro živil. Pri tem smo se osredotočili na informacije, opredeljene v zakonodaji na področju označevanja živil, predvsem na označevanje HV živil,

navajanje specifičnih ZT, ki potrošniku pomagajo razumeti SZT, ter navajanju ustreznih opozoril oz. izjav, ki so zahtevane z vidika zakonodaje. Pri vrednotenju uporabe ZT smo preverjali tudi ali je:

- besedilo specifične ZT primerljivo z besedilom odobrene ZT oz. z besedilom trditve, ki je še v postopku odobritve;
- naveden podatek o vsebnosti hranila oz. druge snovi, na katero se trditev navezuje;
- navedena ustrezna količina hranila oz. druge snovi, na katero se navezuje trditev.

Podatke smo obdelali in vrednotili z računalniškimi programi Microsoft SQL Server Management Studio V13.0, Microsoft Analysis Services Client Tools 13.0, Microsoft Data Access Components (MDAC) 10.0, Microsoft Excel 2010 – vse Microsoft (Redmond, Washington, USA), ter s programskim orodjem CLAS V1.0 – Composition and Labelling information System (Inštitut za nutricionistiko, Ljubljana, Slovenija).

2.1.1.3 Rezultati

Baza podatkov je zajemala 10.633 živilskih izdelkov, ki so bili razvrščeni v 15 različnih kategorij (glej poglavje 2.1.1.2). S PT in/ali ZT je bilo označenih 19 % vseh v raziskavo vključenih živil. S PT je bilo označenih 17 % živil. Kot je razvidno iz Preglednice 1, je bil največji delež živil, označenih s PT, v kategorijah živila za posebne prehranske namene (87 %), žita in žitni proizvodi (34 %), jedilna olja in emulzije (31 %), mlečni izdelki (23 %) in pijače (22 %).

ZT smo našli na 6 % živil, najpogosteje v kategoriji živil za posebne prehranske namene (37 %), nekoliko manj pa v kategorijah žita in žitni proizvodi (11 %), jedilna olja in emulzije (11 %) ter pijače (10 %).

S SVŽ je bil označen le 1 % v raziskavo vključenih živil , pri čemer se je SVŽ pojavil le v 7 kategorijah živil. Najpogosteje so s SVŽ označena jedilna olja in emulzije (6 %), mlečni izdelki (3 %) ter žita in žitni proizvodi (2 %).

Preglednica 1: Pogostost označevanja predpakiranih živil s prehranskimi (PT) in zdravstvenimi trditvami (ZT) ter simbolom varovalnega živila (SVŽ)
Table 1: Prevalence of pre-packed foods labelled with nutrition (PT) and health claims (ZT) and Protective food symbol (SVŽ)

Kategorija živil	**Število izdelkov (N)**	**Odstotek živil označenih s PT**	**Odstotek živil označenih z ZT**	**Odstotek živil označenih s SVŽ**
Pijače	1.393	22 %	10 %	0 %
Kruh in pekovski izdelki	1.247	13 %	4 %	0 %
Žita in žitni proizvodi	1.031	34 %	11 %	2 %
Slaščice	1.132	13 %	6 %	0 %
Pred-pripravljena živila	539	1 %	1 %	0 %
Mlečni izdelki	1.586	23 %	4 %	3 %
Jedilna olja in emulzije	305	31 %	11 %	6 %
Jajca	39	5 %	3 %	0 %
Ribe in ribji izdelki	287	16 %	4 %	0 %
Živila za posebne prehranske namene	117	87 %	37 %	0 %
Sadje in zelenjava	1.134	12 %	4 %	0 %
Meso in mesni izdelki	825	8 %	3 %	1 %
Prigrizki	242	8 %	1 %	0 %
Omake in namazi	637	6 %	1 %	0 %
Ostalo	119	11 %	11 %	0 %
Skupaj	**10.633**	**17 %**	**6 %**	**1 %**

Pri podrobnejšem vrednotenju živil, označenih s PT, smo ugotovili, da je 97 % tovrstnih izdelkov označenih tudi s tabelo HV, kot to zahteva zakonodaja. Skupno je tistim pogojem uporabe PT, katerih izpolnjevanje je mogoče vrednotiti na osnovi podatkov iz označb živil, ustrezalo 86 % živil, označenih s PT. Iz Preglednice 2 je razvidno, da je raba trditev najbolj skladna (≥ 90 %) v kategorijah jajca, pred-pripravljena živila, slaščice, meso in mesni izdelki, kruh in pekovski izdelki ter žita in žitni proizvodi.

Preglednica 2: Označevanje predpakiranih živil, na katerih so navedene PT
Table 2: Labelling of pre-packed foods with PT

Kategorija živil	**Število živil označenih s PT (N)**	**Odstotek živil, označenih s HV**	**Odstotek živil, ki izpolnjujejo izbrane pogoje uporabe[1]**
Pijače	300	95 %	81 %
Kruh in pekovski izdelki	168	96 %	90 %
Žita in žitni proizvodi	350	97 %	90 %
Slaščice	150	97 %	97 %
Pred-pripravljena živila	5	100 %	100 %
Mlečni izdelki	362	99 %	86 %
Jedilna olja in emulzije	94	96 %	82 %
Jajca	2	100 %	100 %
Ribe in ribji izdelki	47	100 %	66 %
Živila za posebne prehranske namene	102	100 %	83 %
Sadje in zelenjava	131	94 %	85 %
Meso in mesni izdelki	64	97 %	95 %
Prigrizki	20	100 %	75 %
Omake in namazi	40	98 %	75 %
Ostalo	13	69 %	62 %
Skupaj	**1.848**	**97 %**	**86 %**

[1] Izbrani pogoji: naveden podatek o vsebnosti hranila oz. druge snovi, na katero se trditev navezuje, navedena ustrezna količina hranila oz. druge snovi, na katero se navezuje trditev

Preglednica 3 prikazuje živila znotraj posameznih kategorij, ki so označena vsaj z eno ZT. Izmed teh jih je bilo z nespecifičnimi ZT označenih 82 % živil, 45 % jih je bilo označenih s SZT, 44 % pa z BTD. Izmed vseh živil, označenih z ZT, je bilo s specifičnimi ZT označenih 35 % živil; prevladovale so FZT (29 %), sledile so ZTZT (6 %) ter ZTO (1 %). Medtem ko smo FZT našli na večini obravnavanih kategorij živil, smo ZTZT in ZTO našli le na izdelkih v nekaterih kategorijah.

Preglednica 3: Navajanje različnih vrst ZT na živilih, označenih z ZT
Table 3: Labelling of different types of ZT on foods labelled with ZT

Kategorija živil	**Živila označena z ZT (N)**	**Odstotek živil označenih z nespecifično ZT[1]**			**Odstotek živil označenih s specifično ZT[1]**			
		BTD	SZT	**BTD in/ali SZT**	FZT	ZTZT	ZTO	**FZT in/ali ZTZT in/ali ZTO**
Pijače	135	36 %	59 %	**90 %**	20 %	0 %	0 %	**20 %**
Kruh in pekovski izdelki	54	50 %	33 %	**78 %**	37 %	0 %	0 %	**37 %**
Žita in žitni proizvodi	116	55 %	45 %	**91 %**	28 %	18 %	0 %	**41 %**
Slaščice	68	16 %	87 %	**97 %**	0 %	16 %	3 %	**19 %**
Pred-pripravljena živila	8	0 %	100 %	**100 %**	0 %	0 %	0 %	**0 %**
Mlečni izdelki	71	69 %	15 %	**76 %**	35 %	0 %	4 %	**39 %**
Jedilna olja in emulzije	34	59 %	18 %	**62 %**	62 %	6 %	0 %	**68 %**
Jajca	1	100 %	0 %	**100 %**	100 %	0 %	0 %	**100 %**
Ribe in ribji izdelki	11	36 %	64 %	**100 %**	9 %	0 %	0 %	**9 %**
Živila za pos. preh. namene	43	9 %	16 %	**26 %**	79 %	2 %	5 %	**86 %**
Sadje in zelenjava	41	76 %	46 %	**98 %**	12 %	0 %	0 %	**12 %**
Meso in mesni izdelki	27	37 %	19 %	**56 %**	44 %	0 %	0 %	**44 %**
Prigrizki	3	0 %	100 %	**100 %**	0 %	0 %	0 %	**0 %**
Omake in namazi	8	88 %	13 %	**100 %**	0 %	0 %	0 %	**0 %**
Ostalo	13	23 %	54 %	**77 %**	23 %	0 %	8 %	**31 %**
Skupaj	**633**	**44 %**	**45 %**	**82 %**	**29 %**	**6 %**	**1 %**	**35 %**

[1] BTD: blagovne znamke, trgovska in domišljijska imena; SZT: splošne zdravstvene trditve; FZT: funkcijske zdravstvene trditve; ZTZT: zdravstvene trditve o zmanjševanju tveganja; ZTO: zdravstvene trditve za otroke

Podrobnejše ugotovitve glede označevanja živil, označenih z ZT, so prikazane v Preglednici 4 (za živila, označena s specifičnimi ZT) in Preglednici 5 (za živila, označena s SZT). Kot je razvidno iz Preglednice 4, je bila večina živil (95 %), ki so označena s specifično ZT, označena tudi s podatki o HV. Najmanj živil, označenih s HV med živili označenimi s specifično ZT, smo zabeležili v kategoriji sadje in zelenjava (20 %). Živil, ki so bila označena s specifično ZT ter izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga, je bilo 129 (59 %). Le v treh kategorijah živil (kruh in pekovski izdelki, mlečni izdelki, ribe in ribji izdelki) je bilo s takšno izjavo označenih več kot 75 % živil. Skupno je le 46 % živil, ki so bila označena s specifično ZT, izpolnjevalo pogoje uporabe, ki so določeni v Uredbi 1924/2006.

Preglednica 4: Označevanje predpakiranih živil, na katerih so navedene specifične ZT
Table 4: Labelling of pre-packed foods with specific ZT

Kategorija živil	Živila označena s specifično ZT (N)	Odstotek živil označenih s HV	Odstotek živil označenih z izjavo[1]	Odstotek živil, ki izpolnjujejo izbrane pogoje uporabe[2]
Pijače	27	89 %	63 %	37 %
Kruh in pekovski izdelki	20	100 %	75 %	55 %
Žita in žitni proizvodi	48	96 %	69 %	63 %
Slaščice	13	100 %	62 %	62 %
Pred-pripravljena živila	0	/	/	/
Mlečni izdelki	28	100 %	96 %	75 %
Jedilna olja in emulzije	23	100 %	57 %	52 %
Jajca	1	100 %	0 %	0 %
Ribe in ribji izdelki	1	100 %	100 %	100 %
Živila za posebne prehranske namene	37	100 %	27 %	11 %
Sadje in zelenjava	5	20 %	0 %	0 %
Meso in mesni izdelki	12	92 %	42 %	33 %
Prigrizki	0	/	/	/
Omake in namazi	0	/	/	/
Ostalo	4	50 %	0 %	0 %
Skupaj	**219**	**95 %**	**59 %**	**46 %**

[1] Izjava o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga;
[2] Izbrani pogoji uporabe: besedilo trditve je primerljivo z besedilom odobrene ZT oz. z besedilom trditve, ki je še v postopku odobritve; naveden podatek o vsebnosti hranila oz. druge snovi, na katero se trditev navezuje; navedena ustrezna količina hranila oz. druge snovi, na katero se navezuje trditev; navedena izjava o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga.

Iz Preglednice 5 je razvidno, da je bilo le 22 % živil, ki so bila označena s SZT, označenih tudi s specifično ZT. Med izdelki označenimi s SZT, po pogostosti označevanja s specifično ZT, izstopajo kategorije mlečni izdelki ter jedilna olja in emulzije, kjer je bila s specifično ZT označena več kot polovica izdelkov. Večina živil (82 %), označena s SZT, je bila sicer označena s podatki o HV, le v 31 % primerih pa smo zasledili tudi označevanje z izjavo o pomenu pestre in uravnotežene prehrane, kakršna je predvidena v zakonodaji. Le 29 % živil, označenih s SZT, je imelo na označbi tako podatke o HV živila, kot tudi izjavo o pomenu uravnotežene prehrane ter zdravega življenjskega sloga.

Preglednica 5: Označevanje predpakiranih živil, na katerih so navedene splošne zdravstvene trditve (SZT)
Table 5: Labelling of pre-packed foods that are carrying general health claims (SZT)

Kategorija živil	**Živila označena s SZT (N)**	**Odstotek živil označenih s HV**	**Odstotek živil označenih s specifično ZT**	**Odstotek živil označenih z izjavo[1]**
Pijače	80	68 %	15 %	18 %
Kruh in pekovski izdelki	18	94 %	22 %	33 %
Žita in žitni proizvodi	52	94 %	37 %	38 %
Slaščice	59	98 %	19 %	51 %
Pred-pripravljena živila	8	88 %	0 %	0 %
Mlečni izdelki	11	100 %	73 %	73 %
Jedilna olja in emulzije	6	100 %	67 %	83 %
Jajca	0	/	/	/
Ribe in ribji izdelki	7	71 %	14 %	14 %
Živila za posebne prehranske namene	7	100 %	14 %	29 %
Sadje in zelenjava	19	47 %	11 %	0 %
Meso in mesni izdelki	5	80 %	0 %	0 %
Prigrizki	3	100 %	0 %	33 %
Omake in namazi	1	0 %	0 %	0 %
Ostalo	7	43 %	14 %	0 %
Skupaj	**283**	**82 %**	**22 %**	**31 %**

[1] Izjava o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga

2.2 OBJAVLJENA ZNANSTVENA DELA

2.2.1 Razširjenost prehranskih in z zdravjem povezanih trditev na predpakiranih živilih: študija v petih evropskih državah

Hieke S., Kuljanic N., Pravst I., Miklavec K., Kaur A., Brown K.A., Egan B.M., Pfeifer K., Gracia A., Rayner M. 2016. Prevalence of nutrition and health-related claims on pre-packaged foods: A five-country study in Europe. Nutrients, 8, 137: 1-16

Študija je bila izvedena v okviru evropskega (FP7) raziskovalnega projekta CLYMBOL (»Role of health-related CLaims and sYMBOLs in consumer behaviour«). V prvem delu projekta je bila določena razširjenost prehranskih in z zdravjem povezanih trditev v simbolni ali ne-simbolni obliki na živilih v Evropski Uniji (EU). Raziskava je bila izvedena v petih državah EU, tudi v Sloveniji. Vzorčenje predpakiranih živil je temeljilo na standardiziranem protokolu z uporabo seznama izdelkov ali načrta trgovine. Zbiranje podatkov je potekalo v petih državah ter v treh vrstah trgovin. Skupno je bilo vzorčenih 2.034 živil in pijač, pri katerih so bile ovrednotene informacije na embalaži. Vsaj ena trditev je bila identificirana na 26 % (95 % CI (24,0 % – 27,9 %) vzorčenih živil in pijač. Šest odstotkov teh trditev je bilo v obliki simbola. Prevladovale so prehranske trditve (64 %), sledile so jim zdravstvene trditve (29 %) in druge trditve o snoveh, ki so posredno povezane z zdravjem (6 %). Najpogostejše zdravstvene trditve so bile funkcijske zdravstvene trditve (47 % vseh trditev), sledile so trditve v zvezi z zmanjšanjem tveganja za bolezen (5 %). Osem odstotkov zdravstvenih trditev je bilo povezanih z razvojem in zdravjem otrok, prisotne pa so bile le na 1 % (0,4 % – 1,1 %) vseh vzorčenih živil. Prehranske in zdravstvene trditve smo najpogosteje našli na živilih za posebne prehranske namene. Razširjenost prehranskih in zdravstvenih trditev v simbolni in ne-simbolni obliki se je med vključenimi državami, pa tudi med različnimi kategorijami živil, zelo razlikovala. Raziskava je zagotovila podatke, ki so pomembni za snovalce politike in živilsko industrijo ter pri nadzoru in vrednotenju uporabe trditev na embalaži živil.

Dovoljenje založnika za objavo članka Hieke in sod. (2016) v tiskani in elektronski obliki je v prilogi A.

nutrients

MDPI

Article

Prevalence of Nutrition and Health-Related Claims on Pre-Packaged Foods: A Five-Country Study in Europe

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Abstract: This study is part of the research undertaken in the EU funded project CLYMBOL ("Role of health-related CLaims and sYMBOLs in consumer behaviour"). The first phase of this project consisted of mapping the prevalence of symbolic and non-symbolic nutrition and health-related claims (NHC) on foods and non-alcoholic beverages in five European countries. Pre-packaged foods and drinks were sampled based on a standardized sampling protocol, using store lists or a store floor plan. Data collection took place across five countries, in three types of stores. A total of 2034 foods and drinks were sampled and packaging information was analyzed. At least one claim was identified for 26% (95% CI (24.0%–27.9%)) of all foods and drinks sampled. Six percent of these claims were symbolic. The majority of the claims were nutrition claims (64%), followed by health claims (29%) and health-related ingredient claims (6%). The most common health claims were nutrient and other function claims (47% of all claims), followed by disease risk reduction claims (5%). Eight percent of the health claims were children's development and health claims but these were only observed on less than 1% (0.4%–1.1%) of the foods. The category of foods for specific dietary use had the highest proportion of NHC (70% of foods carried a claim). The prevalence of symbolic and non-symbolic NHC varies across European countries and between different food categories. This study provides baseline data for policy makers and the food industry to monitor and evaluate the use of claims on food packaging.

Keywords: nutrition claims; health claims; health symbols; food supply; monitoring

1. Introduction

1.1. Background

The use of nutrition and health-related claims (NHC) on foods and non-alcoholic beverages (henceforth foods and drinks or just foods) is regulated in many developed countries. In the European Union (EU), regulations were harmonized in 2006 by Regulation (EC) 1924/2006 [1]. The Regulation applies to all nutrition and health claims made on food packaging. The general principle is that NHC

should not be misleading and should be substantiated by generally accepted scientific data [1,2]. Since the EU Register of health claims made on food entered into force in December 2012 [3], food producers in the EU are allowed to use only authorized health claims and related general non-specific health claims. One exception is claims that are still in the process of scientific evaluation, e.g., botanicals [4].

NHC as well as their symbolic representations (examples of health symbols would be the Dutch Choices logo, the Nordic Keyhole and the Finnish Heart Symbol) may help consumers identify foods that are healthier options, but little is known about how such claims are used by consumers in real-world shopping situations. The pan-European research project "Role of health-related CLaims and sYMBOLs in consumer behaviour" (CLYMBOL) has set out to determine how nutrition and health-related claims and symbols, in their context, can affect consumer understanding, purchase and consumption patterns (for an overview of the project see [5]).

As a starting point to the project, the survey reported here aimed to understand what nutrition and health-related claims and symbols consumers are exposed to, *i.e.*, on which food categories such claims and symbols are most common, which types of claims and symbols are used and to which nutrients and health relationships they refer. While some studies on the prevalence of NHC have been conducted in countries where such claims are relatively well regulated, particularly in the US [6,7], Canada [8,9], Australia [10–13] and New Zealand [14], studies on the European market are scarce and to date no cross-country prevalence study for Europe exists.

In 2009, as part of the EU-funded project FLABEL [15], a study investigated the prevalence of nutrition information, including health claims, for five food categories across all EU Member States plus Turkey [16]. Significant country-to-country differences were reported regarding the prevalence of nutrition and health claims. However, the study did not analyze the different types of claims found. More in-depth analyses are available for the UK [17], Ireland [18] and Slovenia [19]. However, all of these surveys were completed before the EU Register of health claims came into effect in 2012. Some other studies are also available in which the authors selectively focused on specific food categories, for example dairy foods [20] and breakfast cereals [21]. Lastly, the prevalence of nutrition and health claims was also recently investigated in Serbia, a candidate country for EU membership [22].

While monitoring the food supply is an important public health issue, the number of foods available and the diversity of retail environments make this challenging. A global initiative that addresses the harmonization of such data collection is the INFORMAS initiative (International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support). This network has proposed a step-wise approach to surveying food labeling depending on resources, standardized methods for the sampling of retail outlets and foods and priorities for the labeling and related information to be collected [22]. While the selection of all foods within all food categories might be considered ideal [22], a huge volume of data is generated when studies attempt to be entirely comprehensive [19]. Therefore, a sampling approach to the selection of foods is needed particularly for studies investigating different countries. The present study describes a novel approach on how to sample a select number of foods across various countries, using the food categorization scheme [23] that has been adopted by the Global Food Monitoring Group for future monitoring of the food supply [24].

1.2. Research Questions

The aim of this study was to investigate the prevalence of nutrition and health claims as found on foods and drinks across five different European countries. The following research questions were identified:

- What proportion of pre-packaged foods and drinks available in-store in the five countries carry NHC?
- What proportion of these claims is symbolic?
- What types of NHC can be found on pre-packaged foods and drinks?

- To which nutrients or other food components do NHC refer?
- To which health-relationships do health claims refer?
- Which types of foods and drinks carry NHC?

2. Methods and Materials

Labeling data were collected from pre-packaged foods and drinks sampled in five EU countries: the UK, the Netherlands, Germany, Slovenia and Spain. The selection of countries aimed at a geographical spread across Europe. Three types of stores were selected in each country (with a total of 15 stores overall), with the aim of covering a range of different retail outlets, in order to map consumer exposure to food and drink products across a variety of shopping places: a large supermarket/national retailer, a discounter and a neighborhood store. Differences in the penetration of various food labeling information in different retail outlets were reported recently [19], confirming the rationale of the approach used in this study. Stores were selected based on the accessibility of their network within the respective country, as well as comparable store characteristics (e.g., store size). A food or drink (henceforth only referred to as "food") was defined as a single item available for sale in the selected store. This definition meant that the same food in different sized packaging could be included in the survey, on the basis that the packaging for the same food in different sized packages may carry different health-related claims. Within-country, exact duplicates, however, were removed from the database.

Only pre-packaged foods were considered. The EU Regulation on the provision of food information to consumers (EC) 1169/2011 defines a pre-packaged foodstuff as "any single item for presentation as such to the ultimate consumer and to mass caterers, consisting of a foodstuff and the packaging into which it was put before being offered for sale, whether such packaging encloses the foodstuff completely or only partially, but in any case in such a way that the contents cannot be altered without opening or changing the packaging" [25].

2.1. Data Collection

In each of the five countries, approximately 400 foods were sampled *i.e.*, purchased using a randomized sampling approach. A power calculation was conducted to estimate the sample size required. An assumed 50% prevalence rate for NHC was selected in order to ensure an adequate sample size, for the detection of NHC prevalence with 5% precision. The sample size needed for an estimation of prevalence is at maximum when the measured prevalence is 50%. Hence, after adjustment for a finite population and assuming a prevalence rate of 50% for NHC, 400 foods for each country would produce confidence intervals of ±5%, sufficient for distinguishing a 10% difference in prevalence between countries.

In each of the five countries approximately 250 foods were sampled from the supermarket/national retailer, 75 foods were sampled from the discounter and 75 from the neighborhood store. Details of the whole sample are provided in Table 1.

Table 1. Sample overview (sampling method and number of foods).

	UK	Netherlands	Germany	Slovenia	Spain	Total
Large supermarket/ national retailer	floor plan, n = 248	store list, n = 252	store list, n = 248	store list, n = 260	store list, n = 251	1259 (62%)
Discounter	floor plan, n = 75	store list, n = 81	store list, n = 76	store list, n = 78	store list, n = 78	388 (19%)
Neighborhood store	floor plan, n = 75	store list, n = 83	floor plan, n = 75	store list, n = 78	store list, n = 76	387 (19%)
Total no of foods	398 (20%)	416 (20%)	399 (20%)	416 (20%)	405 (20%)	2034 (100%)

Foods were sampled from retail outlets in two ways: either using a store/stock list or failing that a floor plan.

Retailer's store/stock lists were converted to Microsoft Excel spreadsheets, if not already in that format. The following types of product were then excluded: (a) non-food items; (b) food supplements; (c) alcoholic drinks; and (d) unpackaged foods. The remaining foods were assigned an ID number and the appropriately sized sample randomly selected using the RAND function in Excel. The sample of foods was then purchased.

For four of the stores, a store/stock list could not be obtained. In these cases a floor plan was created which mapped the layout of the store (including the location of promotional stands or other non-aisle displays). Each section/aisle was then assigned a number and the number of foods in each section/aisle was estimated using a tally counter. The total number of foods in the store was then estimated and each food location assigned an ID number. Again, an appropriately sized list of food locations was randomly generated using the RAND function in Excel. The researchers then returned to the store and purchased the foods using the list of locations.

Exclusion of products also occurred post sampling. Post-sampling exclusion occurred for unpackaged products selected inadvertently. Foods were selected and purchased in the same time frame (July–August 2013) for all countries. For perishable foods, the packaging was removed. Photographs were taken of all sides of packages carrying at least one claim.

Two pilot studies were carried out: one in Germany at a large supermarket and the other in the UK at a neighborhood store. Feedback from the pilots resulted only in minor changes to the final protocol for data collection.

2.2. Data Extraction

Labeling data were taken from packaging and entered into a database. All NHC were identified and characteristics of the claims were recorded, *i.e.*, whether the claim was worded, pictorial or a combination (both worded and pictorial) and whether it qualified as a symbolic claim. Worded claims were recorded verbatim and translated into English. Pictorial claims (or claims which were a combination of words and picture(s)) were briefly described. The type of health symbol was noted.

Other labeling and food composition data were also collected (e.g., whether the package had front-of-pack nutrition labeling and information about nutrient content from the nutrient declaration).

Additional characteristics of the NHC recorded included their position on pack and the number of times they appeared on one packet. For health claims, it was also noted whether it was a specific health claim, meaning whether a specified nutrient, other substance or health-related ingredient was stated to have a specific health effect, or a non-specific health claim.

2.3. Analysis

Once identified, claims were classified into nutrition claims (including nutrient content claims and nutrient comparative claim), health-related ingredient claims and health claims (including reduction of disease risk claims, nutrient and other function claims, general health claims and children's development and health claims).

All claims were categorized as being either symbolic or non-symbolic. A symbolic claim was defined as a health-related claim (whether a nutrition, health-related ingredient or health claim) that was pictorial or combined words and pictures and for which the criteria for use of the symbol have been published. An example of a symbolic general health claim is the Dutch "Choices" logo [26]. An example of a symbolic nutrient and other function claims is the "Toothfriendly" logo [27]. See Figure 1.

Figure 1. Examples of symbolic claims.

Color-coded nutrition labels (e.g., traffic light or % GDA labeling) did not qualify as a symbolic claim because they present nutritional information but do not suggest a health relationship [28]. All NHC definitions are consistent with EU Regulation:

1. A nutrition claim was defined as "any claim which states, suggests or implies that a food has particular beneficial nutritional properties due to (a) the energy (calorific value) it (i) provides; (ii) provides at a reduced or increased rate; or (iii) does not provide; and/or (b) the nutrients or other substances it (i) contains; (ii) contains in reduced or increased proportions; or (iii) does not contain" [1].
2. Nutrition claims were classified as either a nutrient content claim when it "describes the level of a nutrient contained in a food (or its energy value)" (e.g., "high in fibre" and "low fat") or a nutrient comparative claim "when it compares the composition of the food in question with the composition of other foods" (e.g., "higher in fibre" and "reduced sugar") [1].
3. A health-related ingredient claim was defined as a claim communicating the presence of an ingredient(s) which is not a nutrient or other substance as defined in the EU Regulation [1] but which implies health benefits. In most cases, these claims related to the content of ingredients that are considered as a healthy (e.g., "Contains one of your five a day") or at least a healthier alternative (e.g., "Sweetened only with brown sugar").
4. A health claim was defined as "any claim that states, suggests or implies that a relationship exists between a food category, a food or one of its constituents and health" [1].
5. A general health claim (covered by Article 10(3) of the EU Regulation [1]) was defined as a claim referring to benefits for general health or well-being. A typical example of such a claim is "Good for your health" or "Healthier choice (within this product group)".
6. A nutrient and other function claim (as covered by Article 13 of the EU Regulation [1]) was defined as a health claim that describes or refers to one of the following: (a) the role of a nutrient or other substance in growth, development and the functions of the body; (b) psychological and behavioral functions; or (c) slimming or weight-control or a reduction in the sense of hunger or an increase in the sense of satiety or a reduction of the available energy from the diet. Typical examples of such a claim are "Calcium builds strong teeth" and "Fibre helps maintain a healthy digestive system".
7. A reduction of disease risk claim (covered by Article 14.1(a) of the EU Regulation [1]) was defined as a claim communicating that the consumption of a food category, a food or one of its constituents significantly reduces a risk factor in the development of a human disease. Typical examples of such a claim are "Plant sterols reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease" and "Reduces the risk factor for development of dental caries".

8. A children's development and health claim (covered by Article 14.1(b) of the EU Regulation [1]) was defined as a health claim where children's development and/or health was specifically mentioned. Typical examples of such a claim are "Calcium is needed for normal growth and development of bones in children" and "For your baby's safe and balanced diet". Claims where children were not specifically mentioned, even if these claims were found on foods intended solely for use by children, were not considered children's development and health claims.

Claims such as "natural", "organic" and "halal" were not considered NHCs on the basis that they refer to the method of the production rather than the content. Similarly, information on the presence of additives, preservatives, flavorings, *etc.* was not considered a health-related claim. Allergy advice (e.g., "contains nuts") was not considered to be an NHC nor were references to the presence of a food or food group in the product where there was no clear relationship to its health benefits, e.g., references to milk content. Claims relating to the endorsement of a health-related organization were also not included, e.g., "[Product] supported by the [health association]".

3. Results

Where confidence intervals are provided in tables, they will not be reported in the text. Results are discussed by country, claim type and product category.

3.1. What Proportion of Pre-Packaged Foods and Drinks Available In-Store in the Five Countries Carry NHC?

Twenty-six percent of foods carried at least one nutrition, health-related ingredient or health claim (including symbolic versions of such claims) (Table 2). There were almost twice as many foods carrying nutrition claims as there were foods carrying health claims (21% and 11% respectively). Just 4% of foods carried a health-related ingredient claim. General health claims appeared on 7% of the foods. Only 5% of foods carried a nutrient and other function claim. Just 0.6% of foods carried a reduction of disease risk claim and 0.7% of foods carried children's development and health claims. Products could carry more than one claim.

Thirty percent of foods sampled in the UK carried a nutrition claim, followed by Spain (23%), Slovenia (19%), the Netherlands (17%) and Germany (16%). There was less variation across countries in the number of foods carrying health claims; the highest prevalence was observed in the Netherlands (14%) and the lowest in Spain (7%). The foods sampled in the Netherlands had more instances of general health claims (12%), compared to 4%–6% for the remaining countries. The highest proportion of foods carrying a nutrient and other function claim was found in Slovenia (9%), followed by the UK (7%), Germany (5%), Spain and the Netherlands (both 3%). Overall, the prevalence of reduction of disease risk claims was very low across all countries; it was highest in the UK (1%) and lowest in the Netherlands (0.2%). Similarly, the prevalence of children's development and health claims ranged from 0% (in the Netherlands) to 1.3% (in Germany).

Foods carrying claims tend to carry multiple claims; the average number of NHC per product carrying any claim across the five countries was 2.6 (Table 3). The highest number of claims seen on a product was 17, observed on two baby food products in Spain and Germany. The mean number of nutrition claims per product carrying any claim was slightly higher than the mean number of health claims (2.0 and 1.9, respectively). A Kruskal-Wallis test was used to determine if there were any significant country differences in the number of nutrition claims, health claims or any claims (NHC) of foods that carry such claims. There was a significant country difference in the number of health claims, but the country differences in the number of nutrition claims or NHC claims overall were not statistically significant. The highest number of health claims observed on a single product was 15, found on a baby food, and for nutrition claims, 13 claims found on a confectionery product, both in Germany.

Table 2. Prevalence of nutrition claims, health claims, and symbols in five European countries.

Country	Claim Type	No. of Claims	… of Which Are Symbolic	No. of Foods with a Claim	% of Foods with Claim (95% CIs)
All Countries N = 2034 Foods	**Nutrition claim**	**865**	**1**	**423**	**20.8% (19.0%–22.5%)**
	Nutrient content claim	*797*	**1**	*399*	*19.6% (17.8%–21.3%)*
	Nutrient comparative claims	*68*	**0**	*49*	*2.4% (1.7%–3.1%)*
	Health-related ingredient claim	**105**	**6**	**72**	**3.5% (2.7%–4.3%)**
	Health claim	**392**	**74**	**222**	**10.9% (9.6%–12.3%)**
	General health claim	*153*	*64*	*137*	*6.7% (5.6%–7.8%)*
	Nutrient and other function claim	*185*	*9*	*106*	*5.2% (4.2%–6.2%)*
	Reduction of disease risk claim	*21*	*1*	*12*	*0.6% (0.2%–0.09%)*
	Children's development & health claims	*33*	*0*	*15*	*0.7% (0.4%–1.1%)*
	Any type of claim (NHC)	**1362**	**81**	**528**	**26.0% (24.0%–27.9%)**
UK N = 398 foods	**Nutrition claim**	**247**	**0**	**118**	**29.6 (25.1%–34.1%)**
	Health-related ingredient claim	**65**	**3**	**40**	**10.1% (7.1%–13.0%)**
	Health claim	**85**	**2**	**44**	**11.1% (8.0%–14.1%)**
	General health claim	*30*	*0*	*23*	*5.8% (3.5%–8.1%)*
	Nutrient and other function claim	*38*	*2*	*26*	*6.5% (4.1%–9.0%)*
	Reduction of disease risk claim	*10*	*0*	*4*	*1.0% (0.0%–0.2%)*
	Children's development & health claims	*7*	*0*	*4*	*1.0% (0.0%–2.0%)*
	Any type of claim (NHC)	**397**	**5**	**140**	**35.2% (30.4%–40.0%)**
Nether-lands N = 416 foods	**Nutrition claim**	**154**	**0**	**70**	**16.8% (13.2%–20.4%)**
	Health-related ingredient claim	**12**	**0**	**12**	**2.9% (1.3%–4.5%)**
	Health claim	**73**	**50**	**60**	**14.4% (8.9%–15.2%)**
	General health claim	*52*	*49*	*50*	*12.0% (8.9%–15.2%)*
	Nutrient and other function claim	*19*	*1*	*12*	*2.9% (1.3%–4.5%)*
	Reduction of disease risk claim	*2*	*0*	*1*	*0.2% (0.0%–0.1%)*
	Children's development & health claims	*0*	*0*	*0*	*0.0%*
	Any type of claim (NHC)	**239**	**50**	**103**	**24.8% (20.6%–29.0%)**
Germany N = 399 foods	**Nutrition claim**	**123**	**0**	**64**	**16.0% (12.4%–19.7%)**
	Health-related ingredient claim	**19**	**1**	**13**	**3.3% (1.5%–5.0%)**
	Health claim	**82**	**0**	**37**	**9.3% (6.4%–12.1%)**
	General health claim	*29*	*0*	*23*	*5.8% (3.5%–8.1%)*
	Nutrient and other function claim	*45*	*0*	*20*	*5.0% (2.9%–3.2%)*
	Reduction of disease risk claim	*1*	*0*	*1*	*0.3% (−0.2%–0.7%)*
	Children's development & health claims	*7*	*0*	*5*	*1.3% (0.1%–0.2%)*

Table 2. *Cont.*

Country	Claim Type	No. of Claims	… of Which Are Symbolic	No. of Foods with a Claim	% of Foods with Claim (95% CIs)
Slovenia N = 416 foods	**Nutrition claim**	**144**	**0**	**78**	**18.8% (15.0%–22.5%)**
	Health-related ingredient claim	**3**	**1**	**2**	**0.5% (–0.2%–1.1%)**
	Health claim	**88**	**7**	**52**	**12.5% (0.9%–15.7%)**
	General health claim	*24*	*1*	*23*	*5.5% (3.3%–7.7%)*
	Nutrient and other function claim	*58*	*6*	*36*	*8.7% (5.9%–11.4%)*
	Reduction of disease risk claim	*4*	*0*	*3*	*0.7% (–0.1%–1.5%)*
	Children's development & health claims	*2*	*0*	*1*	*0.2% (–0.2%–0.7%)*
	Any type of claim (NHC)	**235**	**8**	**103**	**24.8% (20.6%–28.9%)**
Spain N = 405	**Nutrition claim**	**196**	**1**	**93**	**23.0% (18.8%–27.1%)**
	Health-related ingredient claim	**6**	**1**	**5**	**1.2% (0.2%–2.3%)**
	Health claim	**64**	**15**	**29**	**7.2% (4.6%–9.7%)**
	General health claim	*18*	*14*	*18*	*4.4% (2.4%–6.5%)*
	Nutrient and other function claim	*25*	*0*	*12*	*3.0% (1.3%–4.6%)*
	Reduction of disease risk claim	*4*	*1*	*3*	*0.7% (–0.1%–1.6%)*
	Children's development & health claims	*17*	*0*	*5*	*1.2% (0.2%–2.3%)*
	Any type of claim (NHC)	**266**	17	**100**	**24.7% (20.5%–28.9%)**

Bold is for main claims we looked at and the total claims. Italic is for the sub-categories of all these claims. Regular font size was only used for the description of the countries to the left.

Table 3. Number of claims per product.

	Mean Number of Nutrition Claims [1]	Highest Number of Nutrition Claims on a Single Product	Mean Number of Health Claims [1]	Highest Number of Health Claims on a Single Product	Mean Number of Any Claim [1]	Highest Number of Any Claims on a Single Product
All countries	2.0	13	1.9	15	2.6	17
UK	2.1	11	1.9	5	2.8	15
Netherlands	2.2	8	1.2	6	2.3	9
Germany	1.9	13	2.2	15	2.7	17
Slovenia	1.8	8	1.7	5	2.3	11
Spain	2.1	12	2.2	11	2.7	17
p value	0.94		<0.01		0.52	

NOTE: per product carrying a claim.

3.2. What Proportion of These Claims is Symbolic?

Substantial differences were observed in the prevalence of symbolic claims between the countries (Table 2). The highest prevalence was found in the Netherlands (12%, (9%–14%)), followed by Spain (4%, (2%–6%)), Slovenia (2%, (1.0%–3.0%)), the UK (1%, (0%–2%)), and Germany (0.3%, (0%–1%)). Almost all of the general health claims in the Netherlands were symbolic—the majority of which comprised of the Choices logo. Spain had a similarly high level of symbolic general health claims, including logos of health organizations such as the Spanish Association for Pediatricians. However, it should be noted that in general the prevalence of symbolic claims was quite low; altogether only 3.88% (3%–5%) of foods were labeled with a symbolic claim.

3.3. What Types of NHC Can Be Found on Pre-Packaged Food and Drinks?

64% of the claims were nutrition claims of which 92% (90%–94%) were classified as nutrient content claims and just 8% (6%–10%) were nutrient comparative claims (Table 2). Health claims accounted for 29% (26%–31%) of the claims recorded. Of these, almost half (47%, (42%–52%)) were nutrient and other function claims, 39% (34%–44%) were general health claims, 8% (6%–11%) were children's development and health claims and the remaining 5% (3%–8%) were reduction of risk claims. The remaining claims fell into the category of health-related ingredient claims (8%, (6%–9%)).

The proportion of nutrition claims was highest in Spain (74% of all claims were nutrition claims), followed by the Netherlands (64%), the UK (62%), Slovenia (61%), and Germany (55%). The proportion of health claims showed slightly less variation across the five countries: it was highest in Slovenia and Germany (both 37%), followed by the Netherlands (31%), Spain (24%) and the UK (21%).

Only 14% (12%–15%) of the NHC were nutrient and other function health claims. The highest proportion was found in Slovenia (25%, (19%–30%)) and lowest in the Netherlands (8%, (5%–11%)). Spain had the highest proportion of children's development and health claims (6%, (3%–9%)) while none were found on foods sampled in the Netherlands. The UK had the highest proportion of disease risk claims (3%, (1%–4%)) whereas Germany had the lowest (only one such claim was found, out of a total of 224 claims identified) (Table 2).

3.4. To Which Nutrients or Other Food Components Do NHC Refer?

More than one third of the nutrition claims referred to vitamins and/or minerals (e.g., "Enriched with important vitamins and minerals") (Table 4). More specifically, 22% referred to vitamins, of which vitamin C was the most common vitamin referenced (e.g., "High in vitamin C") and 13% to minerals, of which calcium was the most common mineral (e.g., "A source of calcium"). Almost a quarter of nutrition claims (24%) referred to the fat content of a food in some way, 12% to the sugar content and 9% to fiber.

Table 4. Nutrients and ingredients referred to in nutrition and health claims (all five countries).

Nutrient	Nutrition Claim (No.)s	% of All Nutrition Claims	Health Claim (No.)s	% of All Health Claims
Energy	40	5%	1	<1%
Protein	35	4%	8	2%
Carbohydrates	109	13%	14	4%
Of which sugars	100	12%	2	1%
Fat	206	24%	31	8%
Total fat	127	15%	5	1%
Saturated fat	7	1%	3	1%
Unsaturated fat	50	6%	23	6%
Omega-3 fatty acids	33	4%	15	4%
Fiber	74	9%	14	4%
Sodium/Salt	35	4%	0	0%
Vitamins and/or minerals	305	35%	64	16%
Vitamins and Minerals	2	<1%	3	1%
Vitamins (any)	187	22%	38	10%
Vitamin C	47	5%	8	2%
Vitamin D	15	2%	9	2%
Vitamin E	19	2%	5	1%
Other specified vitamins	55	6%	11	3%
Unspecified vitamins	51	6%	5	1%
Minerals (any)	116	13%	23	6%
Calcium	55	6%	13	3%
Iron	21	2%	3	1%
Other specified minerals	26	3%	6	2%
Unspecified minerals	14	2%	1	<1%
Probiotics	23	3%	2	1%
Phytosterols/stanols	6	1%	5	1%
Whole products	0	0%	84	21%
Unspecified nutrient	4	<1%	141	36%
Other nutrients	27	3%	9	2%
Ingredients that are not nutrients	1	<1%	19	5%
Herbs	0	0%	12	3%
Seeds	0	0%	3	1%
Whole grain/Whole wheat / Whole foods/Whole meal	1	<1%	2	1%
TOTAL	865	100%	392	100%

Thirty-six percent of health claims referred to an unspecified nutrient or nutrients (e.g., "Complete nutrition for optimal growth") and 21% referred to the whole food (e.g., the claim "Cholesterol reducing" without specifying a nutrient) (Table 4). Sixteen percent of health claims referred to vitamins or minerals. Of the health claims that referred to macronutrients, references to fat were the most common.

3.5. To Which Health-Relationships Do Health Claims Refer?

All health claims were categorized following the International Classification of Functioning, Disability and Health (ICF) [29], in order to ensure comparability with outputs from, e.g., the World Health Organization (WHO). Functions of the digestive, metabolic and endocrine system were referred to in 40% of nutrient and other function claims (Table 5). Of these, 57% (46%–69%) referred to functions related to general metabolic functions and/or weight management functions (e.g., "Weight watchers"). Fifteen percent of nutrient and other function claims referred to functions of the cardiovascular, hematological, immunological and respiratory systems (e.g., "Zinc helps maintain a healthy immune system"), 11% referred to mental functions (e.g., "Glycemic carbohydrates contribute to the maintenance of healthy brain functions") and 10% referred to neuro-musculoskeletal and movement-related functions (e.g., "Growing strong bones").

Table 5. Distribution of nutrient and other function claims by the International Classification of Functioning, Disability, and Health (ICF).

ICF Chapter		No. of Claims	% of Claims (95% CIs)
Mental Functions	Global psychosocial functions	4	2.2% (0.0%–4.3%)
	Energy and drive functions	8	4.4% (1.4%–7.4%)
	Sleep functions	2	1.1% (−0.4%–0.26%)
	Specific mental functions	1	0.5% (−0.5%–1.6%)
	Higher-level cognitive functions	1	0.5% (−0.5%–1.6%)
	Total	**20**	11.0% (6.4%–15.6%)
Sensory Functions and Pain	Seeing and related functions	1	0.5% (−0.5%–1.6%)
	Total	**1**	0.5% (−0.5%–1.6%)
Voice and Speech Functions	Voice functions	4	2.2% (0.0%–4.3%)
	Total	**4**	2.2% (0.0%–4.3%)
Functions of the cardiovascular, hematological, immunological and respiratory systems	Heart functions	9	4.9% (1.8%–8.1%)
	Blood vessel functions	1	0.5% (−0.5%–1.6%)
	Immunological system functions	16	8.8% (4.6%–12.9%)
	Functions of the respiratory system	1	0.5% (−0.5%–1.6%)
	Total	**27**	14.8% (9.6%–20.0%)
Functions of the digestive, metabolic and endocrine systems	Digestive functions	19	10.4% (6.0%–14.9%)
	Defecation functions	5	2.7% (0.3%–5.1%)
	Weight maintenance functions	14	7.7% (3.8%–11.6%)
	General metabolic functions	27	14.8% (9.6%–20.0%)
	Water, mineral and electrolyte balance functions	6	3.3% (0.7%–5.9%)
	Endocrine gland functions	2	1.1% (−0.4%–2.6%)
	Total	**73**	40.1% (32.9%–47.3%)
Genitourinary and reproductive functions	Urinary excretory functions	1	0.5% (−0.5%–1.6%)
	Sexual functions	2	1.1% (−0.4%–2.6%)
	Total	**3**	1.6% (−0.2%–3.5%)
Neuro-musculoskeletal and movement related functions	Functions of the joints and bones	15	8.2% (4.2%–12.3%)
	Muscle endurance functions	4	2.2% (0.0%–4.3%)
	Total	**19**	10.4% (6.0%–14.9%)
Functions of the skin	Functions of the skin	2	1.1% (−0.4%–2.6%)
	Functions of the hair and nails	1	0.5% (−0.5%–1.6%)
	Total	**3**	1.6% (−0.2%–3.5%)
Others	Functions related to the digestive system: Teeth	15	8.2% (4.2%–12.3%)
	Functions of the hematological and immunological systems: Anti-oxidants	8	4.4% (1.4%–7.4%)
	Growth	9	4.9% (1.8%–8.1%)
	Total	**32**	18.1% (12.5%–23.8%)
TOTAL		**185**	100.0% 5.2% (4.2%–6.2%)

For details see http://apps.who.int/classifications/icfbrowser/ [29].

3.6. Which Types of Foods Carry NHC?

The prevalence of health-related claims and symbols for all countries, across all food categories, is presented in Figure 2. "Foods for specific dietary uses" had the highest proportion of nutrition, health and symbolic claims (78%, 71%, and 24%, respectively). According to the classification scheme used in this study [23], this category includes foods intended for babies and infants (e.g., milk formulas and follow-on foods) but also meal replacements (e.g., diet shakes). In this sample, only baby foods were found. This corresponds to the findings reported in Table 3 where the highest number of claims found on a single product (17) was on two baby foods in Germany and Spain. It should be noted that the category of "Foods for specific dietary uses" only represents 2% (0.01%–0.03%) of all foods sampled in this study.

Almost a third of "Cereal and cereal products" and "Beverages" carried nutrition claims, followed by "Dairy products" (28%), "Edible oils and oil emulsions" and "Fish and fish products" (both 26%) and "Sugars, honey and related products" (24%) (Figure 2). The remaining categories had 20% or less

of foods carrying nutrition claims. Twenty-six percent of "Edible oils and oil emulsions" carried health claims, followed by "Beverages" (17%), "Cereal and cereal products" and "Sugars, honey and related products" (both 16%), and "Dairy products" (13%). The remaining food categories had ⩽10% of foods carrying a health claim. All details can be found in the Supplementary Material (Table S1).

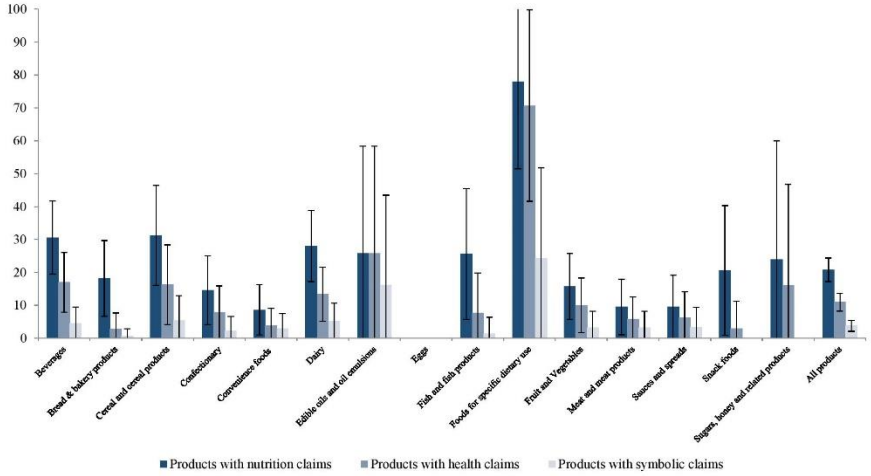

Figure 2. Prevalence of nutrition and health claims (including symbolic ones) by food category. (*Note*: % of foods with claim, including the confidence intervals at 95% (see also Supplementary Material Table S1)).

4. Discussion

The present study assesses the prevalence of NHC on packaged foods currently sold in Germany, the Netherlands, Slovenia, Spain and the UK. Overall, approximately one quarter (26%) of foods sampled in this study carried an NHC. Twice as many foods carried nutrition claims (21%) compared to health claims (11%), followed by a much smaller percentage of health-related ingredient claims (4%).

On a country-level, the overall percentage of foods with at least one claim varied from 35% in the UK to 21% in Germany. The UK also had the highest number of foods carrying a health-related ingredient claim (10%), compared to only two foods (0.5%) surveyed in Slovenia. UK health-related ingredient claims were mostly related to fruit and vegetable consumption (e.g., "One of your five a day") or wholegrain (e.g., "With wholegrain"). Regarding health claims, country-by-country variation was lower and did not follow the same distribution order. The highest frequency of foods carrying at least one health claim (including symbolic representations) was found in the Netherlands and the lowest frequency in Spain. A closer look at the Dutch data show that the majority of health claims identified here comprised of the Choices logo, which was classified as a symbolic general health claim. All five surveyed countries have been governed by the same European food regulation, since 2007. Our results demonstrate that reasons for the reported country differences regarding the prevalence of health claims and symbols appear to be more complex than just the implementation of a supranational regulation. EU Member States differ in their history of use of health claims and symbols prior to the EU regulation, food operators in different countries may employ different marketing strategies for their products, and the use of health symbols is often linked to national organizations issuing those symbols. Furthermore, it has been reported that EU Member States take different approaches to implementing the EU regulation on a national level. This includes national legislation on the responsibilities of food authorities (e.g., inspections), as well as the general control of the food

supply [30]. These differences are currently being investigated in another on-going EU funded project called REDICLAIM (www.rediclaim.eu).

It appears that when foods carry claims, they tend to carry more than one claim, which can either mean that they repeat the same claim on several parts of the package or include more than one claim. The latter is often the case for nutrition claims, *i.e.*, several nutrients are mentioned (e.g., "No sugar, low calories" and "Contains vitamin A, source of iron"). Furthermore, because health claims are commonly communicating functions of specific nutrients or other substances, such claims are commonly accompanied by related nutrition claims (e.g., "High in calcium" and "Calcium is needed for the maintenance of normal bones").

Due to differences in methods, data collection timeframe, countries and food categories surveyed, it is difficult to compare the present findings with those of past surveys and any comparison should be undertaken with caution. Nevertheless, it is useful to note the prevalence of claims that previous studies have reported.

Of the products sampled in this study, 21% carried nutrition claims, compared to 29% that were reported in a study undertaken in the UK in 2011 [17], 37% in Slovenia in 2011 [19] and 48% in Ireland in 2007 [18]. In Serbia, a candidate country for EU membership, 7% were reported in a study undertaken in 2012 [22]. Outside Europe, similar studies reported 46% of foods carrying nutrition claims in Canada in 2013 [9] and 49% in the USA in 2010 [7]. Compared to 11% of products carrying health claims in this study, a prevalence of 15% health claims on food products was reported in the British study [17], 13% in the Slovenian study [19] and 18% in the Irish study [18]. The Serbian study only reported 6% health claims on the food products they sampled [22]. It should be noted that health claims were not regulated in Serbia at the time that the study was done. Outside the EU, 14% health claims were found on food products in a study undertaken in Australia and New Zealand [11] and 9% in the US-based study [7]. While the highest proportion of health claims in the present study comprised of general health claims (7%), only few reduction of disease risk claims (0.6%) were identified. This is in line with findings from other prevalence studies, e.g., <1% of reduction of disease risk claims in the British [17], the Irish [18], the Slovenian [19] and the Canadian study [9] and only 1% in the Australian and New Zealand study [11]. Regarding the prevalence of symbolic claims, the present study reported such claims on 4% of all food packages. The highest proportion of symbolic claims was observed in the Netherlands (12%) and the lowest in Germany (0.3%), which is in line with the results of the FLABEL study mentioned above [16]. The US study reported that 6% of food packages had symbolic claims [7]. A comparison with the Canadian study [9] is not possible due to differences in the definition of symbolic claims between that study and this.

4.1. Strengths

The present study is the first, to-date, to survey several countries across Europe using the same methods, with data collection having taken place after the Regulation went into effect. Aside from providing an updated overview of the prevalence of nutrition, health-related ingredient and health claims on the European market, the present study offers a novel method of data collection in which the sampling frame was rigorously defined. It is hoped that the detailed description of the methods will provide guidance for other researchers on replicating and advancing future claim prevalence studies.

Furthermore, the inclusion of five different countries and the geographical spread that this entails has allowed for European conclusions to be drawn. This study provides an example of how to monitor the prevalence of claims currently on the market, one of the tasks crucial in implementing and monitoring legislation. It is also a necessary step towards making research a useful source of information for future regulation. At the same time, differences across European countries were taken into account by using local researchers for the data extraction. Nuances in the language were more likely to be appreciated by native speakers in each country. This approach required more coordination efforts but the authors believe that this was appropriate and would be the most suitable method for future similar research.

4.2. Limitations

The study was powered to detect a 10% difference in the prevalence of claims by country, which had an effect on comparisons in other respects. For example, the sample size did not allow for country-by-country analysis for each food category. It also did not allow for a store-by-store analysis for each claim type. Having limited resources, the decision was either to focus on a few food categories and the number of investigated jurisdictions or to broaden the number of food categories and countries while limiting the number of foods per country. The latter option was seen as a better way to produce a snapshot of the current situation in the EU market, *i.e.*, what consumers are exposed to, across a variety of stores and food categories.

The selection of an appropriate food categorization system has posed a further challenge in this study. A variety of categorization schemes have been used in similar studies, which significantly limits the comparability of results. The selected scheme was chosen due to the fact that it has been adopted by the Global Food Monitoring Group for all future monitoring of the food supply [23,24]. Although this study is the first to use this categorization scheme for this type of labeling survey, it is the authors' hope that this decision will contribute to the harmonization of food information reporting in future studies.

Last but not least, the cross-sectional design can be considered an additional limitation of this study. In order to examine changes in the food supply, it is recommended to repeat this study at a later point, e.g., after all transition periods of the EU Regulation have ended. A further avenue of future research could be to analyze differences in the prevalence of claims between retail (private label) products and branded products.

5. Conclusions

The prevalence of symbolic and non-symbolic NHC varies across European countries and between different food group categories. Nutrition and/or health claims were found on about a quarter of surveyed pre-packaged foods in five EU countries. The majority of all claims were nutrition claims, followed by health claims and health-related ingredient claims. Health claims were mostly present in the form of nutrient and other function claims, while disease risk reduction and children's development and health claims were observed on less than 1% of the foods. The results of this study not only provide baseline data for policy makers to monitor the use of claims in food information to consumers but also offer the potential to inform future regulation. Results are also important for subsequent phases of CLYMBOL studies involving consumer understanding and use of such information in purchase and consumption behavior.

Supplementary Materials: The following are available online at http://www.mdpi.com/2072-6643/8/3/137/s1, Table S1: Prevalence of nutrition and health claims (including symbolic ones) by food category, Table S2: Food Categories used in the data collection according to Dunford *et al.*: International collaborative project to compare and monitor the nutritional composition of processed foods, *Eur. J. Prev. Cardiol.* **2012**, *19*, 1326–1332.

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References

1. Commission Regulation (EC) No 1924/2006 of the European Parliament and of the Council on Nutrition and Health Claims Made on Foods. Available online: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006R1924-20141213 (accessed on 1 March 2016).
2. Pravst, I. Functional Foods in Europe: A Focus on Health Claims. In *Scientific, Health and Social Aspects of the Food Industry*; Valdez, B., Ed.; In Tech: Rijeka, Croatia, 2012; pp. 165–208.
3. Commission Regulation (EU) No 432/2012 Establishing a List of Permitted Health Claims Made on Foods, Other than Those Referring to the Reduction of Disease Risk and to Children's Development and Health. Available online: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02012R0432-20160101 (accessed on 1 March 2016).
4. Kušar, A.; Pravst, I. Quality and safety of botanical food products and their labelling. *Agro Food Ind. Hi Tech* **2014**, *25*, 33–35.
5. Hieke, S.; Kuljanic, N.; Wills, J.M.; Pravst, I.; Kaur, A.; Raats, M.M.; van Trijp, H.C.M.; Verbeke, W.; Grunert, K.G. The role of health-related claims and health-related symbols in consumer behaviour. *Nutr. Bull.* **2015**, *40*, 66–72. [CrossRef] [PubMed]
6. Brecher, S.J.; Bender, M.M.; Wilkening, V.L.; McCabe, N.M.; Anderson, E.M. Status of nutrition labeling, health claims, and nutrient content claims for processed foods: 1997 Food Label and Package Survey. *J. Am. Diet. Assoc.* **2000**, *100*, 1057–1062. [CrossRef]
7. Colby, S.E.; Johnson, L.; Scheett, A.; Hoverson, B. Nutrition marketing on food labels. *J. Nutr. Educ. Behav.* **2013**, *42*, 92–98. [CrossRef] [PubMed]
8. Sacco, J.E.; Sumanac, D.; Tarasuk, V. Front-of-package references to fiber on foods in Canadian supermarkets highlight the need for increased nutrition knowledge among consumers. *J. Nutr. Educ. Behav.* **2013**, *45*, 518–524. [CrossRef] [PubMed]
9. Schermel, A.; Emrich, T.E.; Arcand, J.; Wong, C.L.; L'Abbé, M.R. Nutrition marketing on processed food packages in Canada: 2010 Food Label Information Program. *Appl. Physiol. Nutr. Metab.* **2013**, *38*, 666–672. [CrossRef] [PubMed]
10. Williams, P.; Yeatman, H.; Zakrzewski, S.; Aboozaid, B.; Henshaw, S. Nutrition and related claims used on packaged Australian foods - implications for regulation. *Asia Pac. J. Clin. Nutr.* **2003**, *12*, 138–150. [PubMed]
11. Williams, P.; Yeatman, H.; Ridges, L.; Houston, A.; Rafferty, J.; Roesler, A.; Sobierajski, M.; Spratt, B. Nutrition function, health and related claims on packaged Australian food products—prevalence and compliance with regulations. *Asia Pac. J. Clin. Nutr.* **2006**, *15*, 10–20. [PubMed]
12. Walker, K.Z.; Woods, J.L.; Rickard, C.A.; Wong, C.K. Product variety in Australian snacks and drinks: How can the consumer make a healthy choice? *Public Health Nutr.* **2008**, *11*, 1046–1053. [CrossRef] [PubMed]
13. Hughes, C.; Wellard, L.; Lin, J.; Suen, K.L.; Chapman, K. Regulating health claims on food labels using nutrient profiling: What will the proposed standard mean in the Australian supermarket? *Public Health Nutr.* **2013**, *16*, 2154–2161. [CrossRef] [PubMed]
14. Devi, A.; Eyles, H.; Rayner, M.; Mhurchu, C.N.; Swinburn, B.; Lonsdale-Cooper, E.; Vandevijvere, S. Nutritional quality, labelling and promotion of breakfast cereals on the New Zealand market. *Appetite* **2014**, *81*, 253–260. [CrossRef] [PubMed]
15. Genannt Bonsmann, S.S.; Celemin, L.F.; Grunert, K.G. Food labelling to advance better education for life. *Eur. J. Clin. Nutr.* **2010**, *64*, S14–S19. [CrossRef] [PubMed]
16. Genannt Bonsmann, S.S.; Celemin, L.F.; Larranaga, A.; Egger, S.; Wills, J.M.; Hodgkins, C.; Raats, M.M. Penetration of nutrition information on food labels across the EU-27 plus Turkey. *Eur. J. Clin. Nutr.* **2010**, *64*, 1379–1385. [CrossRef] [PubMed]
17. Kaur, A.; Scarborough, P.; Matthews, A.; Payne, S.; Mizdrak, A.; Rayner, M. How many foods in the UK carry health and nutrition claims, and are they healthier than those that do not? *Public Health Nutr.* **2015**. [CrossRef] [PubMed]

18. Lalor, F.; Kennedy, J.; Flynn, M.A.T.; Wall, P.G. A study of nutrition and health claims—A snapshot of what's on the Irish market. *Public Health Nutr.* **2010**, *13*, 704–711. [CrossRef] [PubMed]
19. Pravst, I.; Kušar, A. Consumers' exposure to nutrition and health claims on pre-packed foods: Use of sales weighting for assessing the food supply in Slovenia. *Nutrients* **2015**, *7*, 9353–9368. [CrossRef] [PubMed]
20. Menard, C.; Dumas, C.; Gillot, N.; Laurent, L.; Labarbe, B.; Ireland, J.; Volatier, J.-L. The French OQALI survey on dairy products: Comparison of nutrient contents and other nutrition information on labels among types of brands. *J. Hum. Nutr. Diet.* **2012**, *25*, 323–333. [CrossRef] [PubMed]
21. Debeljak, K.; Pravst, I; Košmelj, K.; Kač, M. "Healthier" and "less healthy" classifications according to three nutrient profiling systems relative to nutrition and health claims on food labels. *Acta Aliment.* **2015**, *44*, 561–565.
22. Davidovic, D.B.; Tomic, D.V.; Paunovic, K.Ž.; Vasiljevic, N.D.; Jorga, J.B. Nutrition labelling of pre-packaged foods in Belgrade, Serbia: Current situation. *Public Health Nutr.* **2015**, *18*, 1969–1978. [CrossRef] [PubMed]
23. Dunford, E.; Webster, J.; Metzler, A.B.; Czernichow, S.; Mhurchu, C.N.; Snowdon, W.; L'Abbe, M.; Li, N.; Maulik, P.K.; Barquera, S.; *et al*. International collaborative project to compare and monitor the nutritional composition of processed foods. *Eur. J. Prev. Cardiol.* **2012**, *19*, 1326–1332. [CrossRef] [PubMed]
24. Dunford, E.; Webster, J.; Metzler, A.; Blanco, S.; Ni Mhurchu, C.; Wolmarans, P.; Snowdon, W.; L'Abbe, M. International collaborative project to compare and track the nutritional composition of fast foods. *BMC Public Health* **2012**, *12*, 1–7.
25. Regulation (EU) No 1169/2011 on the Provision of Food Information to Consumers. Available online: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02011R1169-20140219 (accessed on 29 February 2016).
26. Roodenburg, A.J.C.; Popkin, B.M.; Seidell, J.C. Development of international criteria for a front of package food labelling system: The International Choices Programme. *Eur. J. Clin. Nutr.* **2011**, *65*, 1190–1200. [CrossRef] [PubMed]
27. Cinar, A.B.; Murtomaa, H. A holistic food labelling strategy for preventing obesity and dental caries. *Obes. Rev.* **2009**, *10*, 357–361. [CrossRef] [PubMed]
28. Rayner, M.; Wood, A.; Lawrence, M.; Mhurchu, C.N.; Albert, J.; Barquera, S.; Friel, S.; Hawkes, C.; Kelly, B.; Kumanyika, S.; *et al*. Monitoring the health-related labelling of foods and non-alcoholic beverages in retail settings. *Obes. Rev.* **2013**, *14*, 70–81. [CrossRef] [PubMed]
29. World Health Organisation. International Classification of Functioning, Disability and Health (ICF). Available online: http://www.who.int/classifications/icf/en/ (accessed on 29 February 2016).
30. Raats, M.M.; Malcolm, R.N.; Lähteenmaki, L.; Pravst, I.; Gage, H.; Cleary, A.; Klopčič, M. Understanding the impact of European Regulation on the substantiation and use of claims on food and drinks: Design of the REDICLAIM project and initial results. *Nutr. Bull.* **2015**, *40*, 340–348. [CrossRef]

2.2.2 Simboli na sprednji strani embalaže kot orodje za promocijo izbire bolj zdravih živil v Sloveniji: spremljajoče trditve lahko pomembno vplivajo na preference potrošnika

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V preteklih letih so se na označbah živil v različnih državah, vključno s Slovenijo, že začeli uporabljati različni prehranski in/ali zdravstveni simboli. Cilj raziskave je bil raziskati seznanjenost potrošnikov v Sloveniji s simbolom varovalnega živila, njihove asociacije s tem simbolom, in vpliv izgleda simbola na preference potrošnikov. Raziskava je bila izvedena z uporabo spletnega vprašalnika, ki je vključeval metodo asociacije in analizo sestavljenih učinkov. Za nabor odraslih prebivalcev Slovenije (n = 1.050; 534 moških, 516 žensk) sta bila uporabljena panel agencije GfK in socialno omrežje (Facebook). Večina (78 %) udeležencev je navedla, da so simbol varovalnega živila že videli, 64 % pa jih je bilo s simbolom seznanjenih. Seznanjenost je bila potrjena z uporabo metode asociacije, kjer smo analizirali naravo opisa simbola ter razlikovali med opisom izgleda simbola in opisom njegovega pomena. Pri tem je 73 % udeležencev opisalo pomen simbola v povezavi z zdravjem in zdravim življenjskim slogom, kar je potrdilo njihovo seznanjenost s simbolom. Ženske in osebe, ki so v gospodinjstvu odgovorne za nakupovanje živil, so značilno bolj seznanjene s simbolom. Za ugotavljanje vpliva izgleda simbola na potrošnikove preference je bila uporabljena analiza sestavljenih učinkov z dvema atributoma – trije različni simboli, ki smo jih zasledili na živilih v Sloveniji (simbol varovalnega živila, simbol Choices Programme in simbol ključavnice) in različne spremljajoče trditve. Kljub temu, da je bil pri spremljajočih trditvah relativni pomen nižji (29,5 %) kot pri simbolih (70,5 %), smo ugotovili, da lahko izbira spremljajoče trditve znatno vpliva na preference potrošnikov. Najnižja delna korist nivoja je bila zaznana, ko trditev ni bila prisotna, medtem ko je bila najvišja zaznana pri trditvi, ki je povezana z zdravjem (»Varuje zdravje«). Dejstvo, da je veliko sodelujočih seznanjenih s simbolom varovalnega živila nakazuje, da ima simbol potencial za promocijo izbire hranilno bolj ustreznih živil, kar bi lahko bilo dodatno izboljšano z izbiro ustrezne spremljajoče trditve, ki opisuje pomen simbola. Pokazali smo tudi, da je lahko uporaba Facebook oglaševanja uporabna nadomestna metoda pri naboru udeležencev za tovrstne raziskave.

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Front of package symbols as a tool to promote healthier food choices in Slovenia: Accompanying explanatory claim can considerably influence the consumer's preferences

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ABSTRACT

Many nutrition and/or health symbols were introduced in different countries in the past years and Slovenia is no exception. The objective of our study was to examine familiarity with and perception of the Protective Food symbol (PF symbol) in Slovenia and to investigate consumers' associations related to the symbol, and the influence of symbols' appearance on their preferences. The study was conducted through online questionnaire with incorporated word-association tasks and conjoint analysis; GfK consumer panel and social media (Facebook) were used for recruitment of Slovenian adults (n = 1050; 534 men, 516 women). The majority (78%) of the participants reported they had previously seen the PF symbol, and 64% declared familiarity with it. Familiarity was verified using a word-association task in which we analysed the nature of the symbol's description, distinguishing the description of symbol's visual appearance or its meaning. In this task, 73% of the participants described the symbol's meaning with reference to health or a healthy lifestyle, confirming their familiarity with it. Women and those responsible for grocery shopping were significantly more familiar with the symbol. The impact of the symbol's appearance on consumers' preferences was investigated using conjoint analysis consisting of two attributes – three different symbols found on foods in Slovenia (PF symbol, Choices Programme symbol and Keyhole symbol), and accompanying worded claims. Although worded claims had less relative importance (29.5%) than the symbols (70.5%), we show that careful choice of the wording can affect consumers' preferences considerably. The lowest part-worth utility was observed without an accompanying claim, and the highest for the claim directly communicating health ("*Protects your health*"). The fact that most participants are well familiar with the PF symbol indicates the symbol's potential to promote healthier food choices, which could be further improved by an accompanying worded claim that clearly describes its meaning. In addition, the use of Facebook ads is shown to be a useful alternative recruitment method for research with consumers.

1. Introduction

Selecting food is a dynamic process (Köster & Mojet, 2007) which often entails a consideration of price, taste, nutritional value and other factors, and involves a complicated decision-making process (Finkelstein & Fishbach, 2010; Sanlier & Seren Karakus, 2010). Sophisticated marketing techniques and the growing assortment of foods in the marketplace are making the consumer's selection and purchasing decisions very challenging (Lahti-Koski, Helakorpi, Olli, Vartiainen, & Puska, 2012). While healthy dietary habits are crucial for preventing several chronic diseases, many consumers find it difficult to follow nutritional recommendations in practice. Two primary aspects of the consumer choice environment should be noted: (a) the availability of product information; and (b) consumers' prior experience with products. The presence or absence of knowledge and experience affects the types of information processed and the processing heuristics used by the consumer (Bettman & Park, 1980). In addition, there are limits to the amount of information consumers can effectively absorb (Jacoby, Speller, & Berning, 1974).

Food labels offer different cues that consumers consider when evaluating them, which could influence their purchase decision (Loebnitz, Schuitema, & Grunert, 2015; van der Merwe, Bosman, & Ellis, 2014). Ideally, food labelling should help consumers make healthier food choices (Lahti-Koski et al., 2012; Rayner et al., 2013; Vyth et al., 2010). Simplified food labels have been shown to enable a quicker choice of healthier food products (van Herpen & van Trijp, 2011). Another approach is to use simple nutrition- and health-related messages, which can appear on labels as either worded or graphic elements. Use of nutrition and

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health symbols on foods that meet relevant nutritional criteria is another example of such an approach (Borgmeier & Westenhoefer, 2009). Consumers have been shown to prefer simple claims (Bitzios, Fraser, & Haddock-Fraser, 2011) and symbols (Andrews, Burton, & Kees, 2011; Feunekes, Gortemaker, Willems, Lion, & Van den Kommer, 2008), and that even those not interested in health might prefer to choose certain products labelled with such symbols (Vyth et al., 2010).

The communication of meaning in its direct, indirect, intentional and unintentional forms can be examined with semiotics that can help better understand human communication and behaviour (Echtner, 1999) since the image serves as a stimulus that influences cognition, interpretation and preference (Schroeder, 2002). Studying symbols' potential to help simplify complex information has become an important part of food and nutrition research related to consumer food choices and eating habits (Institute of Medicine, 2011). Recent research shows that symbols on food packaging are more important to consumers than worded information (Carrillo, Fiszman, Lähteenmäki, & Varela, 2014). Further, research shows that the comprehension of nonverbal symbolic signs requires a minimum level of cognitive effort (DeRosia, 2008; Fitzsimons et al., 2002) since simplified food labels can present complex nutrition information in a more straightforward and easier way (Sonnenberg et al., 2013). In order for a product to be recognised as healthier based on a symbolic meaning, the symbolic values must be effectively communicated to consumers. Symbols do not directly reveal healthfulness, but serve as a salient motive that can influence product evaluation (Chrysochou & Grunert, 2014). When consumers interpret health-related information on food labels, they must rely on the information available and their existing knowledge (Lahteenmaki, 2015). A number of research studies have focused on evaluating health symbols (Emrich, Mendoza, & L'Abbe, 2012; Emrich et al., 2014), familiarity with them (Lahti-Koski et al., 2012; Neuman, Persson Osowski, Mattsson Sydner, & Fjellstrom, 2014; Vyth et al., 2009, Vyth et al., 2010) and a symbol's influence on consumers' product healthfulness evaluation or choice (Bialkova et al., 2014; Roberto et al., 2012; Steenhuis et al., 2010; van Herpen & van Trijp, 2011; van Herpen, Hieke, & van Trijp, 2014; Van Herpen, Seiss, & van Trijp, 2012), but very few have concentrated on consumers' associations with the symbol (Carrillo et al., 2014; Neuman et al., 2014).

In past years, various nutrition and/or health symbols were introduced in different countries. While some present a condensed summary of nutritional information, others are simple symbols that can be used on foods that meet specific (nutritional) criteria (Latortue & Weber, 2010). The first such front-of-package (FOP) symbol was the Heart Guide symbol created by the American Heart Association (AHA) in 1987 (Institute of Medicine, 2011). In fact, heart health associations were pioneers in setting up such labelling schemes, while food manufacturers became involved with additional schemes after 2004 (Institute of Medicine, 2011). Several symbols were introduced in Europe, for example Sweden's *Keyhole symbol* in 1989 (Neuman et al., 2014), the Finnish Heart symbol in 2000 (Lahti-Koski et al., 2012), and the Choices Programme symbol in 2006 (Van der Bend et al., 2014; Vyth et al., 2010). In Slovenia, a symbol known as the *Protective Food* symbol (hereinafter PF symbol) was also introduced very early on, in 1992, by the Society of Cardiovascular Health of Slovenia (Jan, 2000; Pokorn, 2005) aiming to help consumers make healthier food choices, and to encourage the food industry to reformulate food products. The scheme was initially also promoted using government funding, but the promotion was minimised after the new EU nutrition and health claims regulation was introduced in 2007 (EC No. 1924/, 2006). Nevertheless, the symbol can still be found on about 2% of prepacked products in the food supply (Hieke et al., 2016; Pravst & Kusar, 2015).

Almost 17% of adults (Hlastan-Ribič, Šerona, Maučec Zakotnik, & Borovničar, 2012) and 20% of children (aged 11–15) (Adamson, 2013) are overweight in Slovenia, and a high prevalence of overall non-communicable diseases (NCDs) is observed (Murray et al., 2013). Among OECD (Organisation for Economic Co-operation and Development) countries, only Portugal, Canada, Greece and the USA have higher child obesity levels (Adamson, 2013). Considering these facts, a major national public health priority in a new national resolution (The Ministry of Health RS, 2015) is to promote healthy dietary choices and lifestyles. The PF symbol has been used in Slovenia for several years but its promotion has stagnated considerably in the last 10 years. A specific research project was launched by the *Ministry of Health* and the *Slovenian Research Agency* to evaluate use of the existing PF symbol and provide information needed for a future policy decision on the use of FOP symbols as a possible tool for promoting healthy food choices in Slovenia.

The primary objective of the reported study was to investigate familiarity with and the perception of the Protective Food symbol (PF symbol) in Slovenia. We also investigated consumers' associations with the three FOP symbols found on foods in Slovenia (PF symbol, Choices Programme (hereinafter CP) symbol and Keyhole symbol), and the influence of the symbol's appearance (presence of various explanatory wordings) on their preferences. Given the PF symbol's presence in the market for over 20 years, our hypothesis was that the majority of consumers relate this symbol to health and/or a healthy lifestyle, indicating it could be a valuable starting point if the government were to decide to establish a national scheme for promoting healthy food choices in Slovenia. Another intention was to provide insights about how consumers understand FOP symbols, and how to improve this understanding. Given the wide use of the Internet (Seybert & Reinecke, 2014) the study was conducted using an online questionnaire, while recruitment involved use of a standard commercial consumer panel. Additional recruitment also occurred through social media (Facebook) to provide information on whether such a cost-effective technique can be used to reach specific target populations in research with consumers.

2. Methods

2.1. Design of the study

The online questionnaire was prepared using the SPSS Data Collection Software (a survey administered by GfK) and the web survey provider 1 ka.si (used in a social media campaign). The questionnaire included the following sections: (1) participants' socio-demographic characteristics; (2) a word-association task; (3) symbol recall; (4) a conjoint study; and (5) an evaluation of each symbol based on statements provided. In parts 2, 3 and 5 of the questionnaire, the symbols were presented without any additional text. In the conjoint study, the symbols were presented with selected worded claims or without a claim.

2.2. Recruitment of participants

A quota sample of 1050 participants aged between 18 and 60 was obtained via two recruitment methods, a market research company consumer panel (N = 500) and a social media campaign (N = 550). The structure of the sample is comparable with the Slovenian population based on gender and age. For both methods combined, 78% of participants declared either sole or joint responsibility for the grocery shopping. All data were collected in October 2014. The participants' socio-demographic characteristics are reported in Table 1. No significant differences were found in the participants' gender, age distribution, or education, or grocery shopping responsibility in the samples recruited by the consumer panel and social media. Similarly, no significant differences were found between both samples in relation to previous exposure to any of three tested symbols, therefore further analyses were conducted on a sample, compiled using both recruitment methods.

Table 1
Socio-demographic and other characteristics of the participants by recruitment method (N = 1050).

	Total n (%)	Market research agency n (%)	Social media n (%)	*p*-Value[a]	Slovenian population (%)[b]
Gender					
Male	534 (51%)	258 (52%)	276 (50%)	0.646	51.5%
Female	516 (49%)	242 (48%)	274 (50%)		48.5%
Age group					
18–29	253 (24%)	127 (25%)	126 (23%)	0.348	23%
30–39	251 (24%)	110 (22%)	142 (26%)		25%
40–49	296 (28%)	148 (30%)	147 (27%)		25%
50–60	250 (24%)	115 (23%)	135 (25%)		27%
Education					
Primary school or less	30 (3%)	8 (2%)	22 (4%)	0.065	13%
High school	510 (49%)	236 (47%)	274 (50%)		46%
Undergraduate	286 (27%)	141 (28%)	145 (26%)		30%
Postgraduate	224 (21%)	115 (23%)	109 (20%)		11%
Grocery shopping responsibility					
Solely	544 (52%)	275 (55%)	269 (49%)	0.983	
Jointly	280 (27%)	149 (30%)	131 (24%)		
No	226 (22%)	76 (15%)	150 (27%)		

[a] *p*-Values of the differences in characteristics between the recruitment methods: no significant differences ($p > 0.05$).
[b] Characteristics of the Slovenian population according to Slovenian statistical office's SI-Stat Data Portal (http://pxweb.stat.si/pxweb/dialog/statfile1.asp).

2.2.1. Recruitment using the consumer panel

The GfK Slovenia panel was used, which has approximately 9100 members, of whom 500 were recruited via email based on their age (18–60 years) and gender (a ratio between males and females close to 1).

2.2.2. Recruitment using social media

Facebook (FB) was used, which has about 669,000 registered users aged 18–60 in Slovenia. A social media advertising campaign was launched using FB Ads Manager, which enables the targeted promotion of ads using various parameters, including age and gender. The campaign was carried out using 'website click' promotions. In a pre-test of using FB ads for web surveying, we determined that women are quite more responsive than men; considerable differences were also observed for different age groups. To assure the final sample's representative nature, the FB campaign was created using two identical ads, one targeting male and the other female users. We first started with the campaign targeting the male population; the campaign targeting women started after 250 male responses had been collected. The specific age distribution of the FB users was managed using a step-by-step approach: Both campaigns were launched for users aged 18 and above, until we reached 100 responses per campaign. In the next stage, the inclusion criteria were changed to solely target users above 30 years of age. This controlled approach enabled us to end up with a sample (Table 1) comparable to the general population in terms of age and gender.

2.3. Stimuli

The stimuli set consisted of three directive (Hodgkins et al., 2012) symbols that appear on products in the Slovenian market. The Slovenian PF symbol is the most commonly used in the marketplace, while the other two symbols are used in some European countries, but can only be found on a minority of (imported) products in the Slovenian food supply (Fig. 1).

2.4. Word-association task

Participants were shown each of the three symbols and asked to write anything that came to mind upon seeing the symbol. Word association (WA) is a quick, simple and useful qualitative method commonly used in both psychology and sociology (Roininen, Arvola, & Lähteenmäki, 2006). Words expressed through the WA task are supposed to be spontaneous productions with fewer constraints on participants as opposed to interviews or closed questionnaires which yield more biased results (Wagner, Valencia, & Elejabarrieta, 1996). These data were collected at the start of the questionnaire; in the questionnaire's introduction there was no suggestion that the questionnaire (or the included symbols) were in any way related to food. It should be noted that in practice the PF and the CP symbols are used on foods with explanatory wordings (claims), which were not shown in the word-association task. This enabled us that all symbols used in the word-association task were directive, meaning they included no additional nutritional information (Hodgkins et al., 2012) - avoiding possible effects of the worded claims on the responses.

Fig. 1. The symbols used in the study (from left): Protective food symbol (PF symbol), Choices Programme symbol (CP symbol), Keyhole symbol.

2.5. Conjoint analysis

Conjoint analysis is a method used to estimate the importance individuals assign to different predefined attributes (Green & Srinivasan, 1978). The conjoint analysis design consisted of two attributes – symbols (three different symbols: PF symbol, CP symbol, Keyhole symbol) and worded claims (four different variations: no claim, general claim *"I know what I eat" (in Slovenian: "Vem, kaj jem")*, a nutrition claim *"Rich in nutrients" (in Slovenian: "Bogat s hranili")*, a health claim *"Protects your health" (in Slovenian: "Varuje zdravje")*). The rationale for selecting these wordings is provided in the Discussion section. The worded claim was placed in accordance with actual use with the symbols with the exception of the Keyhole symbol which is generally not accompanied by a worded claim. The full factorial design produced 12 different combinations. In addition, we prepared a choice-based conjoint design where a fractional factorial design was used for the selection of profiles to be compared and the incomplete block design was used to generate the comparisons. The final design included 12 different comparisons, each consisting of three different choices. Each choice set was counterbalanced. For each choice set, the participants were asked "Which of the symbols shown below would you prefer on food packages to indicate that the food has better nutritional composition?"

2.6. Consumers' familiarity with and perception of the selected symbols

After being informed that the symbols could appear on food packages, for each of the three symbols participants were asked to indicate, on a 7-point Likert scale (with an additional "I don't know" option), the extent to which they agreed with the following statements: (a) I like the symbol; (b) I am familiar with the symbol; (c) the symbol is present on foods with better nutritional composition; (d) the symbol is intended for the consumer to enable an easier choice of food with better nutritional composition; and (e) the symbol is used for increasing sales of the food product. The order of presenting the symbols was randomised and balanced.

2.7. Data analyses

Participants' associations were first sorted to calculate the proportion of responses related with health, food or a healthy lifestyle. Since the proportion of such responses regarding the CP and Keyhole symbols was very low (14% and 4%, respectively) compared to the PF symbol (73%), more in-depth analysis was only performed for the latter symbol. Participants' associations with the PF symbol were sorted based on the description of the symbol – whether they were describing the symbol's appearance or the symbol's meaning. In addition, we categorised the symbol's associations based on references to health or a healthy lifestyle. For the main categorisation, an initial coding framework was developed and refined as the coding progressed, collapsing unused codes and adding codes based on recurring categories in the narratives. Two persons did the classification in the original language of the questionnaire. Associations that did not belong to any of the categories were coded as "Other".

Conjoint analysis was performed with conjoint analysis software within the XLStat statistical software package (Addinsoft, version 2014.4.07). To test differences between recruitment methods, association task responses and participants' symbol evaluations, the chi-square and analysis of variance were used. All of these tests were performed with SPSS software (IBM, version 13.0).

3. Results

3.1. Word associations

The word-association task revealed major differences in participants' responses to the three investigated symbols. With the CP and Keyhole symbols, which are very rarely used on foods in Slovenia, the proportion of responses related with health, food or a healthy lifestyle was very low (14% and 4%, respectively). While the Keyhole symbol was most commonly associated with a keyhole or the Ludo board game, the CP symbol was mostly associated with phrases connected with sun/nature and tourism, although a series of other associations was also observed.

On the contrary, a much higher proportion of responses related with health, food or a healthy lifestyle was observed for the most commonly used FOP symbol in Slovenia – the PF symbol (73%) – which was therefore further analysed based on the description of the symbol.

3.1.1. Appearance vs. meaning

Results of the word-association task for the PF symbol are presented in Table 2. Most participants described the symbol's meaning (78%) rather than its appearance (22%). As anticipated, participants who had seen the symbol before were more likely to describe its meaning rather than its appearance. Significant differences in symbol description were also observed between genders ($p = 0.006$), levels of education ($p < 0.001$) and levels of responsibility for grocery shopping ($p = 0.020$). Women were more likely to describe the symbol's meaning compared to men. This was also the case in more formally educated participants (highest ratios observed for postgraduates (86%) and those who declared their sole/joint responsibility for grocery shopping).

3.1.2. Categorisation of associations

To provide more information on the consumers' associations with the PF symbol, we next investigated only how the symbol's meaning was described (Table 3). Responses were arranged in the following categories:

(a) *separate description of food and health* (without a relationship between food and health, e.g. health, apple; or apple, healthy for the heart);
(b) *health-related food description* (descriptions relating food to health and vice versa, e.g. healthy diet, healthy foodstuff, healthy food, food healthy for the heart);

Table 2
Nature of the PF symbol's description in relation to participants' characteristics (N = 1026).

	n	Associations related to the symbol		p-Value[a]
		Appearance (%), n = 203	Meaning (%), n = 823	
Gender				
Male	514	23%	77%	0.006
Female	512	16%	84%	
Age group				
18–29	243	19%	81%	0.272
30–39	247	17%	83%	
40–49	291	20%	80%	
50–60	245	24%	76%	
Education				
Primary school or less	29	31%	69%	<0.001
High school	494	23%	77%	
Undergraduate	281	17%	83%	
Postgraduate	222	14%	86%	
Grocery shopping				
Solely	536	18%	82%	0.020
Jointly	271	19%	81%	
No	219	26%	74%	
Seen the symbol before				
Yes	802	16%	84%	<0.001
No	224	34%	64%	

[a] p-Values of the differences in characteristics between the groups: highly significant differences ($p < 0.001$); very significant differences ($p < 0.01$); significant differences ($p < 0.05$). Analyses performed for 1026 participants; 24 participants were excluded because they did not provide a response in the word-association section of the questionnaire.

Table 3
Participants' associations related to how the meaning of the PF symbol was described (N = 823).

	Total (n)	Separate description of food and health	Health-related food description	General health-related description	Specific health-related description	Other	p-Value[a]
	823	9%	19%	16%	47%	9%	
Gender							
Male	395	10%	21%	16%	42%	11%	0.026
Female	428	8%	17%	17%	52%	6%	
Age group							
18–29	197	16%	13%	19%	40%	12%	0.196
30–39	205	10%	21%	12%	48%	9%	
40–49	234	5%	21%	15%	53%	6%	
50–60	187	6%	19%	19%	47%	9%	
Education							
Primary school or less	20	5%	15%	10%	50%	20%	0.196
High school	380	9%	18%	17%	45%	11%	
Undergraduate	232	7%	20%	16%	47%	9%	
Postgraduate	191	11%	17%	16%	51%	4%	
Grocery shopping							
Solely	442	8%	20%	17%	48%	7%	0.548
Jointly	220	10%	16%	15%	49%	10%	
No	161	10%	18%	16%	43%	13%	
Seen the symbol before							
Yes	676	9%	22%	15%	49%	5%	<0.001
No	147	11%	5%	20%	37%	27%	

[a] *p*-Values of the differences in characteristics between the groups: highly significant differences ($p < 0.001$); very significant differences ($p < 0.01$); significant differences ($p < 0.05$). Analyses performed using the word-association task data for 823 participants, which described the PF symbol with a meaning (see Table 2).

(c) *general health-related descriptions* (e.g. healthy life, health-friendly);
(d) *specific health-related descriptions* (e.g. healthy heart, good for the heart (and vascular system)); and
(e) *other* (responses which did not fit in any previous category).

Descriptions of the PF symbol were mostly associated with health or a healthy lifestyle (91% of the descriptions of the meaning, corresponding to 73% of the participants included in the association analysis study). Almost half the descriptions of the meaning (47%) were categorised as a specific health-related description, while 16% were general health-related descriptions. Associations with food were also common (28%: 19% and 9% for *health-related food description*, and *separate description of food and health*, respectively). The most common verbatim phrase used by 7.4% of participants describing the symbol's meaning was "healthy heart", followed by "healthy for the heart" (4.7%), "good for the heart (and vascular system)" (2.7%) and "healthy diet" (2.2%). Statistically significant differences were observed between genders ($p = 0.026$) and between participants who had or had not seen the symbol before ($p < 0.001$).

3.2. Assessment of consumers' preferences using conjoint analysis

In the next stage, we explored what kind of symbol consumers would prefer on labels to indicate healthier foods. The influence of the symbol's appearance on consumers' preferences was investigated using conjoint methodology. The analysis was first conducted on a whole sample (N = 1050), using two attributes – the selected symbols (Fig. 1) and the accompanying worded claims. As reported in Table 4, the relative importance was higher for the symbols (70.5%) than for the accompanying claims (29.5%). Part-worth utilities show that participants overall prefer the PF symbol (0.720), followed by the CP symbol (0.315) and did not like the Keyhole symbol (−1.035). With regard to the accompanying worded claims, positive part-worth utilities were observed for the health claim "Protects your health" (0.336) and the general claim "I know what I eat" (0.193), whereas negative part-worth utilities were observed for the nutrition claim (−0.130), and where no claim was present (−0.399). Additional analysis was conducted on a sub-sample of participants that have not seen the PF symbol (N = 224), showing similar relative importance (67.1% for the symbols, and 32.9% for accompanying claims), and same order of part-worth utilities, but with some differences in their magnitude (0.556 for the PF symbol, 0.426 for the CP symbol and −0.982 for the Keyhole symbol).

As reported in Table 4, the relative importance was higher for the symbols (70.5%) than for the accompanying claims (29.5%). Part-worth utilities show that participants overall prefer the PF symbol (0.720), followed by the CP symbol (0.315) and did not like the Keyhole symbol (−1.035). With regard to the accompanying worded claims, positive part-worth utilities were observed for the health claim "Protects your health" (0.336) and the general claim "I know what I eat" (0.193), whereas negative part-worth utilities were observed for the nutrition claim (−0.130), and where no claim was present (−0.399).

3.3. Assessment of consumers' familiarity with and perception of the selected symbols

In all, 78% of the participants reported that they had previously seen the PF symbol, three-quarters of whom specified that they observed it on foods and/or associated the symbol with the Society of Cardiovascular Health of Slovenia, which is operating the PF symbol scheme. To provide further insights into the familiarity with and perception of all three symbols included in our survey, consumers were asked to indicate the extent to which they agreed with various statements using a 7-point Likert scale, with an additional "I don't know" option (Table 5). The PF symbol received the highest ratings for every statement provided. On the contrary, the Keyhole symbol received the lowest scores for each statement, while the CP symbol was rated in between. Participants

Table 4
Part-worth utilities of each attribute for all participants (N = 1050).

Attribute	Attribute level	Total
Symbol	Protective food symbol (PF symbol)	0.720
	Choices Programme symbol (CP symbol)	0.315
	Keyhole symbol	−1.035
	Relative importance (%)	*70.5*[a]
Worded claim	No claim	−0.399
	General claim ("I know what I eat")	0.193
	Nutrition claim ("Rich in nutrients")	−0.130
	Health claim ("Protects your health")	0.336
	Relative importance (%)	*29.5*[a]

[a] Mean relative importance for each attribute.

Table 5
Participants' perception of the selected symbols.

Statement	Symbols						p-Value[b]
	Protective food symbol		Choices Programme symbol		Keyhole symbol		
	Mean[a]	SD	Mean[a]	SD	Mean[a]	SD	
I like the symbol.	5.5 (n = 1037)	1.5	5.5 (n = 1026)	1.5	3.2 (n = 1001)	1.8	<0.000
I am familiar with the symbol.	5.5 (n = 1023)	1.7	3.6 (n = 960)	1.9	2.4 (n = 965)	1.6	<0.000
The symbol is present on foods with better nutritional composition.	5.6 (n = 917)	1.4	4.6 (n = 711)	1.6	3.2 (n = 661)	1.7	<0.000
The symbol is intended for consumers to enable them an easier choice of foods with better nutritional composition.	5.5 (n = 936)	1.4	4.8 (n = 765)	1.6	3.5 (n = 699)	1.8	<0.000
The symbol is used for increasing sales of the food product.	4.8 (n = 910)	1.8	4.7 (n = 780)	1.7	3.9 (n = 735)	1.9	<0.000

[a] Measured using a Likert scale 1 (strongly disagree) to 7 (strongly agree) with the exclusion of participants who selected the "I don't know" option.
[b] *p*-Values of the differences for statement between the groups: highly significant differences ($p < 0.001$).

liked the PF and CP symbols equally, while familiarity with the PF symbol was considerably higher. It should be mentioned that a notable proportion of participants selected the "I don't know" option when evaluating the CP and Keyhole symbols, while this was less common with the PF symbol. Interestingly, no significant differences were observed for the PF and CP symbols when rating the statement that the symbol is used by the industry to increase sales of the food product; relatively high scores were received for both symbols ($4.8 \pm 1.8, 4.7 \pm 1.7$, respectively).

4. Discussion

4.1. Consumers' awareness, perception and associations with the PF symbol

Information found on food labels, including nutrition and health claims and symbols, could influence consumers' perceived healthfulness of a product, and food preferences. When food labelling elements stimulate consumers to purchase (and consume) foods whose nutritional composition is superior to other foods within the category, this can contribute to healthy dietary choices, reducing the risks for a number of common global NCDs. However, to efficiently apply this approach in practice it is important to understand how consumers perceive health-related elements on food labels. In Europe, some FOP symbols are being extensively promoted and their use is increasing in certain countries. An example of such symbols are the CP symbol (used in the Netherlands, France and the Czech Republic (Van der Bend et al., 2014)) and the Keyhole symbol, a common Nordic label for healthier food products (Neuman et al., 2014). A big difference between them lies in management of the symbol. While the CP symbol is managed by an independent company (and related to fees for companies which use the symbol) (Van der Bend et al., 2014; Vyth et al., 2010), the Keyhole symbol has a governance structure and does not involve a licensing procedure (Van der Bend et al., 2014).

FOP symbols are recognised as a possible important element in the promotion of healthy dietary choices in the new Slovenian *Resolution on the national programme on nutrition and physical activity for health 2015–2025* (The Ministry of Health RS, 2015). However, while the *Protective Food* (PF) symbol has been used in Slovenia for >20 years, its promotion has stagnated considerably in the last ten years, and policymakers need to decide to either support/upgrade the existing scheme or opt for a new scheme, possibly one whose use is increasing in other European countries. However, before making further policy decisions on this topic, data about consumers' awareness and perception of the FOP symbols, particularly the PF symbol, are needed.

Our study primarily focused on the PF symbol. Considering the growing use of the CP and Keyhole symbols in certain European countries, and the fact we were able to find some (imported) foods labelled with these symbols in the Slovenian market, we decided to include them in our study. We should note that, to our knowledge, these two symbols were never actively promoted in Slovenia, and did not expect familiarity with these symbols in an important share of the population. Nevertheless, the data about these two symbols are valuable for several reasons, including as a reference for comparison with the PF symbol and to better understand the perception of the symbols' appearance among those unfamiliar with the symbol. Such data will also be useful while planning the development of schemes and planning their promotion in environments where schemes are not yet used.

We showed that most participants (78%) declared they had previously seen the PF symbol. While the differences between age groups were not significant, the lowest exposure to the symbol was observed in the youngest participants (18–29 years; 73%). This can be explained by the symbol's limited promotion, particularly in this age group. The symbol is managed by the Society of Cardiovascular Health of Slovenia, which has about 8000 members and organises various health-related educational events for the public where the symbol is promoted. However, its activities chiefly target adults at risk for the development of cardiovascular diseases so younger people are somewhat less exposed to the symbol.

The word-association task revealed that the majority of participants described what the symbol is communicating rather than its appearance, especially if they had seen the symbol before. The proportion of adults familiar with the symbol was high considering the limited dissemination of the symbol. Familiarity with the symbol is a two-step process where the symbol must first be recognised and, second, the symbol needs to be linked to a proper meaning (recall) (Zajonc, 1968). In the last 15 years, familiarity with the symbol among Slovenian adults has increased, from approximately 40% (Jan, 2000) to 64% as found in our study. Moreover, 73% of the participants who stated they had seen the symbol before were able to correctly define the symbol's meaning. These results are similar to those reported in the Netherlands, where 62–88% of respondents reported familiarity with the CP symbol (Vyth et al., 2010; Vyth et al., 2009) and those in Sweden, where 65% of participants understood the meaning of the Keyhole symbol (Larsson, Lissner, & Wilhelmsen, 1999).

In line with the results of previous research, participants referred to health in relation to the heart symbol with a non-verbal health mention (Carrillo et al., 2014). Since the image of a heart tends to be linked to health (Carrillo et al., 2014), which is closely related to lifestyle, it is no surprise that the majority of participants in our study linked the PF symbol to health and/or a healthy lifestyle. Symbols represent a set of attributes whose promotion has given them certain meaning. That is why the heart symbol can be related to heart health (Purnhagen, van Herpen, & van Kleef, 2015). Almost half the participants described the symbol with specific health descriptors (mainly heart-related), while less than one-third indicated a food relationship. Women tended to more commonly relate the symbol to a specific health description as opposed to men (Table 3, $p < 0.05$) and the same stands for people who had seen the symbol in comparison to those who had not (Table 3, $p < 0.001$). This could be related to the fact that a bigger proportion of women stated they were solely responsible for grocery shopping than

men and are therefore more familiar with the symbol. Some other studies also reported that women are more familiar with the national health symbol than men are (Lahti-Koski et al., 2012; Larsson et al., 1999).

4.2. Consumers' preferences and perception of FOP symbols

Moreover, we studied the participants' preferences for different health symbols that appear on food labels in combination with different accompanying worded claims. The study was conducted with three differently worded claims, of which one is a nutrition claim ("Rich in nutrients"), one could be considered a health claim ("Protects your health") and in history was already used on foods in Slovenia, while the last one may be considered a general claim ("I know what I eat"). Such claim is used as part of the CP symbol in some countries, for example the Czech Republic. From the regulatory point of view, the use of a general claim such as "I know what I eat" is more convenient than the use of nutrition or health claims, which need to be in line with quite strict EU nutrition and health claims (EC No. 1924/, 2006).

Imagery is a powerful tool that can influence attitudes and, further, the mechanisms for processing images differ from those that are verbally presented (Branthwaite, 2002; Edell & Staelin, 1983). Conjoint analysis showed that participants were generally more inclined to symbols than claims. This agrees with a previous study on symbols and health claims (Carrillo et al., 2014). This could be partly related to their health motivation since higher motivation leads to deeper processing of information, which could result in a bigger impact of claims, while for consumers with less health motivation this may lead to more superficial information processing and a greater influence of imagery (Chrysochou & Grunert, 2014). As expected, the study revealed a stronger preference for the PF symbol. This symbol has long been present on foods in the Slovenian market and consumers are thus more familiar with it. It was previously shown that repeated exposure can enhance the liking of stimuli (Zajonc, 1968) and therefore affect attitude formation that is independent of conscious recognition (Hansen & Wänke, 2009). Therefore, we also conducted an analyses on a sub-sample of participants, which were not familiar with the PF symbol: the preferences for the CP symbol were still strongest, but notably lower in comparison to the results for the whole sample (part-worth utility 0.772 for the CP symbol on the whole sample, and 0.556 on the sample of participants, not familiar with the PF symbol). The preference for the CP symbol was also positive in both analyses, which could be explained with its design. For example, some colours have the potential to evoke associations with health, meaning they can also strengthen the messages (Wasowicz, Stysko-Kunkowska, & Grunert, 2015). However, participants did not like the Keyhole symbol. This might be related to the fact that consumers are unfamiliar with the symbol and its meaning; accordingly, they did not associate its appearance with healthier foods. Previous research showed that familiarity with food labelling information is an important determinant of consumers' attention (Bialkova & van Trijp, 2010) and can further influence assessment of a product (Carrillo, Varela, & Fiszman, 2012).

Within the worded claims, which were presented together with the symbol, the participants showed a stronger preference for the health claim "*Protect your health*". This claim was actually already used together with the PF symbol up until 2007, before the EU regulation on nutrition and health claims on foods was accepted. This might have affected the participants' preference for the claim because consumers tend to have a positive preference for claims they are familiar with (Miklavec, Pravst, Grunert, Klopčič, & Pohar, 2015). Considerably lower but still positive part-worth utility was observed for the general claim "*I know what I eat*", while participants did not like the nutrition claim "*Rich in nutrients*". The lowest part-worth utility was observed if no worded claim was added (Table 4). Consumers might thus still prefer additional information that can help them understand the symbol. Evidence shows that consumers prefer symbols that give additional information about the nutrient quality of food (Mejean, Macouillard, Péneau, Hercberg, & Castetbon, 2013). In addition, worded information can often provide a supporting message that helps interpret the image (Meggs, 1992).

Results of the conjoint study are in agreement with consumers' awareness of the symbols. While 78% of the participants reported they had previously seen the PF symbol, much lower ratings were reported for the CP and Keyhole symbols (22% and 11%, respectively). Similar results were observed when the participants were asked if they were familiar with those symbols (Table 5): 64% of the participants agreed (or strongly agreed) they were familiar with the PF symbol, but only 16% and 6% with the CP and Keyhole symbols, respectively. Considering that these two symbols have not been promoted in Slovenia, this was expected, despite their greater use in other countries.

However, we should mention considerable differences in liking the tested symbols. The appearance of the Keyhole symbol is not directly related with food or health, and the message behind the symbol is unknown to Slovenian consumers. For example, beside keyhole and the Ludo board game, typical phrases used in the word-association task included security, human figure, etc. This shows that participants did not relate the Keyhole to foods or health. Low scores for liking were therefore observed (Table 5: 3.2 ± 1.8). On the contrary, significantly higher liking scores were observed for the CP symbol, which is also found on very few products in the Slovenian market, but its design and colours were probably the factors that influenced the higher liking scores (5.5 ± 1.5), which were comparable with the much better recognised PF symbol (5.5 ± 1.5). This was somewhat surprising because the word-association task revealed quite a variety of phrases associated with the CP symbol (in addition to the most common phrases – sun/nature and tourism – participants also mentioned OK tick, bird, quality, etc.), although it was also previously reported that consumers have a positive attitude to the CP symbol and make associations with health and naturalness (Wasowicz et al., 2015). In addition, women gave a higher liking score for all of the symbols, which is in line with other studies (Lahti-Koski et al., 2012; Vyth et al., 2009). Over a quarter of the participants chose the "*I don't know*" option when evaluating the CP and Keyhole symbols, with the exception of statements related to liking and familiarity. Since familiarity with both symbols was low, this could be expected. Manisera and Zuccolotto (2014) suggest that the "*don't know*" response carries information about the consumer's ambiguity regarding a certain response.

4.3. Additional discussion and conclusions

The study was conducted using two recruitment methods, namely by use of a standard commercial consumer panel and social media (targeted FB advertising). We demonstrated that the controlled social network recruitment of participants can yield a similar socio-demographic sample compared to recruitment via an agency. Similar results were previously reported in a study targeting adolescent girls where FB recruitment was compared with traditional methods (Jones, Saksvig, Grieser, & Young, 2012). Given that we did not observe significant differences between the two samples, it is relevant to ask whether targeted FB advertising can be considered as a cost-effective technique to reach specific target populations. Literature reports show that this is not necessarily the case. For example, Heffner, Wyszynski, Comstock, Mercer, and Bricker (2013) used six recruitment channels of which social media had the lowest cost-efficiency, while the contrary was reported in a study where FB recruitment of young adult smokers proved to be cost-effective (Ramo, Rodriguez, Chavez, Sommer, & Prochaska, 2014). In our study, the (external) cost of the recruitment per participant was also lower in the case of FB advertising, yet we should note that: (a) the FB recruitment required careful control of the recruitment throughout the whole recruitment period (increasing the internal costs); and (b) a considerable proportion of the FB advertising budget was related to the recruitment of adults over 30 years, particularly men. In our case, the average cost per participant was reduced because of the lower advertising prices for the ads targeting women,

whereas if we had targeted men only this would have easily exceeded the recruitment cost when using commercial consumer panels.

Some limitations of the study should be mentioned. Considering the recruitment methods and the fact the study was conducted using an online questionnaire, we did not reach the population that has no access to the Internet. While in some countries specific consumer panels are organised so as to assure the representative structure of the panel (for example, by providing Internet access to those without such access), all panels available in Slovenia recruit among Internet users only. Nevertheless, such consumer panels (usually provided by the agencies) are commonly used in studies investigating consumer behaviour (Carrillo et al., 2014; Emrich et al., 2014; Vyth et al., 2009). While such studies could be limited in their representativeness of the population (Szolnoki & Hoffmann, 2013), this can also be the case with standard recruitment methods due to limited responsiveness of the participants (Tolonen, Ahonen, Jentoft, Kuulasmaa, & Heldal, 2015). We should also note the considerable growth in use of the Internet and social media, both globally (Golbeck, 2015) and in Slovenia, where the Internet is available in 78% of households and most Internet users also use social media (Seybert & Reinecke, 2014; Zupan, 2015). Nevertheless, while the structure of our sample is comparable with the Slovenian population based on gender and age, we determined lower proportion of participants with lower education (primary school or less: 4% vs. 13% in the Slovenian population). Another study limitation is that the conjoint study was conducted using images of symbols, without the food package. This was decided on to exclude the possible influence of the matrix food. For example, in practice FOP symbols can be found on a variety of foods, and some of those (for example yoghurts) might be perceived by consumers as healthier than others (vegetable fats, for example), which could also have a major impact on perception of the FOP symbol. However, in order to make the task more realistic the study question was formulated in such a way that participants needed to imagine the presence of the symbol specifically on a food package (but without noting the food type). Further, we should also note that the tested worded claims used in the conjoint study cannot be extrapolated or generalised to different claims.

In conclusion, the majority of the participants, particularly those responsible for grocery shopping, is well familiar with the Protective Food (PF) symbol. They remembered having seen it on foods and described it by referring health or a healthy lifestyle. Consumers' familiarity with the symbol is crucial in order for it to be able to influence their food choices and, given the results of this study, the PF symbol has the potential to influence consumers' food choices. However, about one-third of the participants responsible for grocery shopping is still poorly familiar with the symbol, and these are quite evenly distributed across all age groups included. We have shown that the PF symbol's potential to promote healthy food choices could be further improved with a clear accompanying worded claim describing its meaning. Among the tested claims, the strongest effect was measured for the health claim "*Protects your health*". Future studies should focus on assessing the effects of the FOP symbol on consumers' behaviour also by using choice experiments in specific food categories, and real-life interventions in the shopping environment. The PF symbol can of course only promote healthy choices if it is actually used on foods with a favourable nutritional composition. The next phases of our research project are therefore focused on assessing how healthy in fact are foods labelled with the PF symbol compared to foods not involved in this voluntary labelling scheme, and on evaluating the motives, experiences and limitations of PF symbol use among food business operators.

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References

Adamson, P. (2013). Child well-being in rich countries: A comparative overview. *Innocenti Report Card no. 11* (pp. 56) (Florence).

Andrews, C. J., Burton, S., & Kees, J. (2011). Is simpler always better? Consumer evaluations of front-of-package nutrition symbols. *Journal of Public Policy & Marketing, 30*, 175–190.

Bettman, J. R., & Park, C. W. (1980). Effects of prior knowledge and experience and phase of the choice process on consumer decision processes: A protocol analysis. *Journal of Consumer Research, 7*, 234–248.

Bialkova, S., & van Trijp, H. (2010). What determines consumer attention to nutrition labels? *Food Quality and Preference, 21*, 1042–1051.

Bialkova, S., Grunert, K. G., Juhl, H. J., Wasowicz-Kirylo, G., Stysko-Kunkowska, M., & van Trijp, H. C. M. (2014). Attention mediates the effect of nutrition label information on consumers' choice. Evidence from a choice experiment involving eye-tracking. *Appetite, 76*, 66–75.

Bitzios, M., Fraser, I., & Haddock-Fraser, J. (2011). Functional ingredients and food choice: Results from a dual-mode study employing means-end-chain analysis and a choice experiment. *Food Policy, 36*, 715–725.

Borgmeier, I., & Westenhoefer, J. (2009). Impact of different food label formats on healthiness evaluation and food choice of consumers: A randomized-controlled study. *BMC Public Health, 9*.

Branthwaite, A. (2002). Investigating the power of imagery in marketing communication: Evidence-based techniques. *Qualitative Market Research: An International Journal, 5*, 164–171.

Carrillo, E., Fiszman, S., Lähteenmäki, L., & Varela, P. (2014). Consumers' perception of symbols and health claims as health-related label messages. A cross-cultural study. *Food Research International, 62*, 653–661.

Carrillo, E., Varela, P., & Fiszman, S. (2012). Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. *Food Research International, 48*, 209–216.

Chrysochou, P., & Grunert, K. G. (2014). Health-related ad information and health motivation effects on product evaluations. *Journal of Business Research, 67*, 1209–1217.

Commission Regulation (EC) No 1924/2006 of 20 December 2006 on nutrition and health claims made on foods (2006). *Official Journal of the European Union*, 9–25.

DeRosia, E. D. (2008). The effectiveness of nonverbal symbolic signs and metaphors in advertisements: An experimental inquiry. *Psychology and Marketing, 25*, 298–316.

Echtner, C. M. (1999). The semiotic paradigm: Implications for tourism research. *Tourism Management, 20*, 47–57.

Edell, J. A., & Staelin, R. (1983). The information processing of pictures in print advertisements. *Journal of Consumer Research, 10*, 45–61.

Emrich, T. E., Mendoza, J. E., & L'Abbe, M. R. (2012). Effectiveness of front-of-pack nutrition symbols: A pilot study with consumers. *Canadian Journal of Dietetic Practice and Research, 73*, 200–203.

Emrich, T. E., Qi, Y., Mendoza, J. E., Lou, W., Cohen, J. E., & L'Abbe, M. R. (2014). Consumer perceptions of the nutrition facts table and front-of-pack nutrition rating systems. *Applied Physiology Nutrition and Metabolism - Physiologie Appliquee Nutrition Et Metabolisme, 39*, 417–424.

Feunekes, G. I. J., Gortemaker, I. A., Willems, A. A., Lion, R., & Van den Kommer, M. (2008). Front-of-pack nutrition labelling: Testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. *Appetite, 50*, 57–70.

Finkelstein, S. R., & Fishbach, A. (2010). When healthy food makes you hungry. *Journal of Consumer Research, 37*, 357–367.

Fitzsimons, G. J., Hutchinson, J. W., Williams, P., Alba, J. W., Chartrand, T. L., Huber, J., et al. (2002). Non-conscious influences on consumer choice. *Marketing Letters, 13*, 269–279.

Golbeck, J. (2015). Facebook. In J. Golbeck (Ed.), *Introduction to social media investigation* (pp. 65–84). Boston: Syngress.

Green, P. E., & Srinivasan, V. (1978). Conjoint analysis in consumer research - issues and outlook. *Journal of Consumer Research, 5*, 103–123.

Hansen, J., & Wänke, M. (2009). Liking what's familiar: The importance of unconscious familiarity in the mere-exposure effect. *Social Cognition, 27*, 161–182.

Heffner, J. L., Wyszynski, C. M., Comstock, B., Mercer, L. D., & Bricker, J. (2013). Overcoming recruitment challenges of web-based interventions for tobacco use: The case of web-

based acceptance and commitment therapy for smoking cessation. *Addictive Behaviors, 38*, 2473–2476.
Hieke, S., Kuljanic, N., Pravst, I., Miklavec, K., Kaur, A., Brown, K. A., et al. (2016). Prevalence of nutrition and health-related claims on pre-packaged foods: A five-country study in Europe. *Nutrients*, 8.
Hlastan-Ribič, C., Šerona, A., Maučec Zakotnik, J., & Borovničar, A. (2012). Overweight and obesity. In J. Maučec Zakotnik, S. Tomšič, T. Kofol Bric, A. Korošec, & L. Zaletel Kragelj (Eds.), *Zdravje in vedenjski slog prebivalcev Slovenije: trendi v raziskavah CINDI 2001–2004–2008* (pp. 147–160). Ljubljana: Inštitut za Varovanje Zdravja Republike Slovenije.
Hodgkins, C., Barnett, J., Wasowicz-Kirylo, G., Stysko-Kunkowska, M., Gulcan, Y., Kustepeli, Y., et al. (2012). Understanding how consumers categorise nutritional labels: A consumer derived typology for front-of-pack nutrition labelling. *Appetite, 59*, 806–817.
Institute of Medicine (2011). *Front-of-package nutrition rating systems and symbols: Promoting healthier choices*. Washington, DC: The National Academies Press.
Jacoby, J., Speller, D. E., & Berning, C. K. (1974). Brand choice behavior as a function of information load: Replication and extension. *Journal of Consumer Research, 1*, 33–42.
Jan, N. (2000). Milk and dairy products among health protecting food products. *Mljekarstvo, 50*, 67–70.
Jones, L., Saksvig, B. I., Grieser, M., & Young, D. R. (2012). Recruiting adolescent girls into a follow-up study: Benefits of using a social networking website. *Contemporary Clinical Trials, 33*, 268–272.
Köster, E. P., & Mojet, J. (2007). Theories of food choice development. In L. Frewer, & H. VanTrijp (Eds.), *Understanding consumers of food products* (pp. 93–124) (1st ed.). Cambridge: Woodhead Publishing.
Lahteenmaki, L. (2015). Consumer interpretation of nutrition and other information on food and beverage labels. In P. Berryman (Ed.), *Advances in food and beverage labelling* (pp. 133–148) (1st ed.). Oxford: Woodhead Publishing.
Lahti-Koski, M., Helakorpi, S., Olli, M., Vartiainen, E., & Puska, P. (2012). Awareness and use of the heart symbol by Finnish consumers. *Public Health Nutrition, 15*(03), 476–482.
Larsson, I., Lissner, L., & Wilhelmsen, L. (1999). The 'green keyhole' revisited: Nutritional knowledge may influence food selection. *European Journal of Clinical Nutrition, 53*, 776–780.
Latortue, K. Y., & Weber, J. A. (2010). Taking a closer look at nutrition symbols on food labels. *Journal of the American Dietetic Association, 110*, 517–519.
Loebnitz, N., Schuitema, G., & Grunert, K. G. (2015). Who buys oddly shaped food and why? Impacts of food shape abnormality and organic labeling on purchase intentions. *Psychology and Marketing, 32*, 408–421.
Manisera, M., & Zuccolotto, P. (2014). Modeling "don't know" responses in rating scales. *Pattern Recognition Letters, 45*, 226–234.
Meggs, P. B. (1992). *Type and image: The language of graphic design*. New York: Van Nostrand Reinhold.
Mejean, C., Macouillard, P., Péneau, S., Hercberg, S., & Castetbon, K. (2013). Consumer acceptability and understanding of front-of-pack nutrition labels. *Journal of Human Nutrition and Dietetics, 26*, 494–503.
Miklavec, K., Pravst, I., Grunert, K. G., Klopčič, M., & Pohar, J. (2015). The influence of health claims and nutritional composition on consumers' yoghurt preferences. *Food Quality and Preference, 43*, 26–33.
Murray, C. J., Atkinson, C., Bhalla, K., Birbeck, G., Burstein, R., Chou, D., et al. (2013). The state of US health, 1990–2010: Burden of diseases, injuries, and risk factors. *JAMA: The Journal of the American Medical Association, 310*, 591–608.
Neuman, N., Persson Osowski, C., Mattsson Sydner, Y., & Fjellstrom, C. (2014). Swedish students' interpretations of food symbols and their perceptions of healthy eating. An exploratory study. *Appetite, 82*, 29–35.
Pokorn, D. (2005). *O znaku "Varuje zdravje". Za Srce, XIV2. (pp. 11–12), 11–12.*
Pravst, I., & Kusar, A. (2015). Consumers' exposure to nutrition and health claims on prepacked foods: Use of sales weighting for assessing the food supply in Slovenia. *Nutrients, 7*, 9353–9368.
Purnhagen, K. P., van Herpen, E., & van Kleef, E. (2015). The potential use of visual packaging elements as nudges - an analysis on the example of the EU health claims regime. *Wageningen working papers in law and governance* (pp. 1–33).
Ramo, D. E., Rodriguez, T. M., Chavez, K., Sommer, M. J., & Prochaska, J. J. (2014). Facebook recruitment of young adult smokers for a cessation trial: Methods, metrics, and lessons learned. *Internet Interventions, 1*, 58–64.
Rayner, M., Wood, A., Lawrence, M., Mhurchu, C. N., Albert, J., Barquera, S., et al. (2013). Monitoring the health-related labelling of foods and non-alcoholic beverages in retail settings. *Obesity Reviews, 14*, 70–81.
Roberto, C. A., Shivaram, M., Martinez, O., Boles, C., Harris, J. L., & Brownell, K. D. (2012). The smart choices front-of-package nutrition label. Influence on perceptions and intake of cereal. *Appetite, 58*, 651–657.
Roininen, K., Arvola, A., & Lähteenmäki, L. (2006). Exploring consumers' perceptions of local food with two different qualitative techniques: Laddering and word association. *Food Quality and Preference, 17*, 20–30.
Sanlier, N., & Seren Karakus, S. (2010). Evaluation of food purchasing behaviour of consumers from supermarkets. *British Food Journal, 112*, 140–150.
Schroeder, J. E. (2002). *Visual consumption*. London; New York: Routledge.
Seybert, H., & Reinecke, P. (2014). Half of Europeans used the internet on the go and a fifth saved files on internet storage space in 2014. http://ec.europa.eu/eurostat/statistics-explained/index.php?title=Internet_and_cloud_services_-_statistics_on_the_use_by_individuals (Acceessed 19.08.16)
Sonnenberg, L., Gelsomin, E., Levy, D. E., Riis, J., Barraclough, S., & Thorndike, A. N. (2013). A traffic light food labeling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. *Preventive Medicine, 57*(4), 253–257.
Steenhuis, I. H. M., Kroeze, W., Vyth, E. L., Valk, S., Verbauwen, R., & Seidell, J. C. (2010). The effects of using a nutrition logo on consumption and product evaluation of a sweet pastry. *Appetite, 55*(3), 707–709.
Szolnoki, G., & Hoffmann, D. (2013). Online, face-to-face and telephone surveys—Comparing different sampling methods in wine consumer research. *Wine Economics and Policy, 2*(2), 57–66.
The Ministry of Health RS (2015). Resolution on the National Programme on nutrition and physical activity for health 2015–2025. http://www.mz.gov.si/fileadmin/mz.gov.si/pageuploads/javna_razprava_2015/Resolucija_o_nac_programu_prehrane_in_in_tel_dejavnosti_jan_2015.pdf (Accessed 19.08.16)
Tolonen, H., Ahonen, S., Jentoft, S., Kuulasmaa, K., & Heldal, J. (2015). Differences in participation rates and lessons learned about recruitment of participants–the European health examination survey pilot project. *Scandinavian Journal of Public Health, 43*, 212–219.
Van der Bend, D., Van Dieren, J., De Vasconcelos, M., Wezenbeek, N. L. W., Kostareli, N., Guerreiro Rodrigues, P., et al. (2014). A simple visual model to compare existing front-of-pack nutrient profiling schemes. *European Journal of Nutrition & Food Safety, 4*, 429–534.
Van der Merwe, D., Bosman, M., & Ellis, S. (2014). Consumers' opinions and use of food labels: Results from an urban — rural hybrid area in South Africa. *Food Research International, 63*(Part A), 100–107.
Van Herpen, E., & van Trijp, H. C. M. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite, 57*, 148–160.
Van Herpen, E., Hieke, S., & van Trijp, H. C. M. (2014). Inferring product healthfulness from nutrition labelling. The influence of reference points. *Appetite, 72*, 138–149.
Van Herpen, E., Seiss, E., & van Trijp, H. C. M. (2012). The role of familiarity in front-of-pack label evaluation and use: A comparison between the United Kingdom and The Netherlands. *Food Quality and Preference, 26*, 22–34.
Vyth, E. L., Steenhuis, I. H., Mallant, S. F., Mol, Z. L., Brug, J., Temminghoff, M., et al. (2009). A front-of-pack nutrition logo: A quantitative and qualitative process evaluation in The Netherlands. *Journal of Health Communication, 14*, 631–645.
Vyth, E. L., Steenhuis, I. H., Vlot, J. A., Wulp, A., Hogenes, M. G., Looije, D. H., et al. (2010). Actual use of a front-of-pack nutrition logo in the supermarket: consumers' motives in food choice. *Public Health Nutrition, 13*, 1882–1889.
Wagner, W., Valencia, J., & Elejabarrieta, F. (1996). Relevance, discourse and the 'hot' stable core social representations—A structural analysis of word associations. *British Journal of Social Psychology, 35*, 331–351.
Wasowicz, G., Stysko-Kunkowska, M., & Grunert, K. G. (2015). The meaning of colours in nutrition labelling in the context of expert and consumer criteria of evaluating food product healthfulness. *Journal of Health Psychology, 20*, 907–920.
Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9*, 1–27.
Zupan, G. (2015). Household and individual use of the internet, Slovenia, 2015. http://www.stat.si/StatWeb/prikazi-novico?id=5509&idp=10&headerbar=8 (Acceessed 19.08.16)

2.2.3 Vpliv zdravstvenih trditev in hranilne sestave na izbiro jogurta pri potrošnikih

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Navajanje zdravstvenih trditev na živilih z manj ugodno hranilno sestavo lahko predstavlja tveganje za zavajanje nekaterih skupin potrošnikov pri izbiri živil. Cilj študije je bil raziskati vpliv navajanja trditev na potrošnikovo izbiro jogurta z različno hranilno sestavo ter vpliv bolj ali manj poznane trditve na izbiro živila. V študiji, v katero je bilo vključenih 371 potrošnikov, je bila uporabljena analiza sestavljenih učinkov ter metoda razvrščanja v skupine. Kot modelno živilo je bil uporabljen sadni jogurt. Raziskali smo vpliv sledečih atributov na potrošnikovo izbiro: prisotnost/odsotnost trditve o probiotikih in trditve o presnovi maščob; vsebnost sladkorja; in vsebnost maščobe. Rezultati kažejo, da kljub temu, da je v splošnem v primerjavi s testiranimi trditvami potrošnikom bolj pomembna hranilna sestava jogurta, obstajajo skupine potrošnikov, ki so bolj občutljive na prisotnost z zdravjem povezanih trditev. Opazili smo naklonjenost potrošnikov k poznani trditvi o probiotikih in nenaklonjenost k nepoznani trditvi o presnovi maščob. Rezultati nakazujejo, da so nekatere skupine potrošnikov bolj občutljive na navajanje z zdravjem povezanih informacij in so tako tudi bolj izpostavljene tveganju, da bi bile zavedene, v kolikor bi bila hranilna sestava jogurta manj zaželena. Takšnim tveganjem bi se lahko izognili z uvedbo profilov hranil za omejitev navajanja trditev na živilih.

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The influence of health claims and nutritional composition on consumers' yoghurt preferences

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ABSTRACT

The use of health claims on foods with a poor nutritional composition could pose a risk of misleading some groups of consumers in their food choices. This study aimed to explore the influence of the use of claims on consumers' preferences for yoghurts with a different nutritional composition and the influence of more and less familiar claims on food choices. The study was conducted on 371 consumers using conjoint methodology and further cluster analysis. Fruit yoghurt was used as a base product. We investigated the impact of the following product attributes on consumers' preferences: presence/absence of a probiotic and fat metabolism claim; sugar content; and fat content. The results suggest that, while consumers generally consider the nutritional composition of yoghurt to be more important than the tested claims, some groups of consumers are more sensitive to the use of health-related statements. We observed the consumers' generally positive preference for a familiar probiotic claim, and their negative preference for a non-familiar fat metabolism claim. Overall, these results indicate that some groups of consumers are more sensitive to the use of health-related communications and are therefore more exposed to the risk of being misled if the composition of the yoghurt they buy is in fact less favourable. It would be beneficial if nutrient profiles were introduced to limit the use of claims on foods.

1. Introduction

Changes in dietary and health patterns and physical activity are increasing the risk of non-communicable diseases, which are the leading cause of global mortality (Diepeveen, Ling, Suhrcke, Roland, & Marteau, 2013; WHO, 2010). While some consumers are more keen on the promotion of a healthy lifestyle and healthy food choices (Lalor, Madden, McKenzie, & Wall, 2011), changing the eating patterns of the general population is a very complex problem. One tool used in efforts to improve eating patterns involves informing consumers with detailed nutrition information and some countries have introduced this as part of their mandatory food labelling (Grunert & Wills, 2007). The mandatory labelling of a nutrition declaration was introduced in the European Union (EU) in 2007 for foods labelled with nutrition or health claims, while other prepacked foods will be affected at the end of 2016 (EC, 2011; Pravst, 2012).

Food labelling is regulated to both help consumers make informed choices regarding the food they consume and prevent any practices that may mislead them. In recent years, food labels have commonly included statements claiming beneficial nutritional or health effects – nutrition and health claims. While the occurrence of such claims is both category- and country-specific (Bonsmann et al., 2010), yoghurts and breakfast cereals are recognised as categories where the use of health claims is most frequent (Lalor, Kennedy, Flynn, & Wall, 2010; Pravst, Kušar, Pohar, & Klopčič, 2013).

It is well established that consumers' ability to understand food labelling information entails many different factors, such as socio-demographic characteristics, nutrition knowledge, familiarity with the food along with label format and articulation (Cowburn & Stockley, 2005; Grunert, Wills, & Fernandez-Celemin, 2010; Nocella & Kennedy, 2012). Poor understanding of such information can have a negative impact on healthy food choices and market efficiency (Nocella & Kennedy, 2012). It has been shown that consumers accept food labelling as beneficial (Zezelj, Milosevic, Stojanovic, & Ognjanov, 2012) and that they have a stronger preference for simple health statements (Bitzios, Fraser, & Haddock-Fraser, 2011), which are easier to understand, even though more familiarity with health claims may lead to a preference for more complete and informative – and hence longer – claims (Grunert

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et al., 2009). A lack of understanding of health claims can limit perceptions of the intended meaning and may cause suspicions regarding the product. Further, consumers have expressed doubts over the claimed effects of foods (Niva & Mäkelä, 2007; Svederberg & Wendin, 2011). In some cases, consumers do not read the claims carefully or transfer the meaning from a familiar food label to an unfamiliar one, potentially leading to overgeneralisation and inaccurate conclusions (Draper et al., 2011; Fullmer, Geiger, & Parent, 1991). Some consumers search for additional information on a food package to help them relate the claim to their earlier knowledge and experiences (Svederberg & Wendin, 2011), while others find reading food labels time-consuming and strenuous (Signal et al., 2008; Zezelj et al., 2012). The response to food labels is also influenced by the way in which information is presented. Health claims are usually written in a technical language that consumers are unfamiliar with, limiting their ability to understand a claim's meaning; this can lead to: (a) a positivity bias, whereby a consumer gives better ratings for a product only because a claim is present; (b) a halo effect, which occurs when a consumer rates a product higher on attributes unrelated to the claim; and (c) a magic-bullet effect, when a consumer applies inappropriate health benefits to a product (Roe, Levy, & Derby, 1999).

Further, consumers' acceptance of foods labelled with claims depends on their familiarity and perceptions related to the perceived fit of the ingredients and carrier or base products (Krutulyte et al., 2011; Verbeke, 2010). It has been shown that consumers perceive some nutrients as either qualifying (i.e. vitamins) or disqualifying (i.e. fat, sugars) and that they consider the nutritional value of foods as important when selecting foods, particularly when it comes to qualifying nutrients (Hoefkens, Verbeke, & Van Camp, 2011). On the other hand, it is poorly understood how different health claims influence consumers' food preferences when disqualifying nutrients are involved. Studies investigating this area are also very important for informing policy-makers about the need to regulate the use of health claims on foods. Consumers can perceive products labelled with nutrition or health claims as healthier, which can influence their purchasing decisions (Verbeke, Scholderer, & Lähteenmäki, 2009). To avoid misleading consumers with the use of health claims on foods that are high in disqualifying nutrients, European regulation introduced the setting of nutrient profiles (EC, 2006), but this part of the legislation has not yet been implemented (Cappuccio & Pravst, 2011; Pravst, 2011). To enable efficient science-based decisions in this process, it is also vital to define different consumer segments and identify those most vulnerable to the nature of nutrition and health claims (Van Trijp & Van der Lans, 2007).

As consumers differ in terms of health consciousness, nutritional knowledge, familiarity with nutrients and functional ingredients, and previous experience with foods with health claims, we expect that consumers also differ in their reaction to health claims in the context of different levels of disqualifying nutrients. Previous studies have taken such differences into account by distinguishing different consumer segments, but have either analysed only one type of claim (Cox, Evans, & Lease, 2008) or have not placed the claims in the context of disqualifying nutrients (Annunziata & Vecchio, 2013; Hailu, Boecker, Henson, & Cranfield, 2009; Sorenson & Bogue, 2005; Sparke & Menrad, 2009).

Therefore, the objectives of our study were: (a) to study consumers' preferences for fruit yoghurt when different claims are present in combination with different levels of disqualifying nutrients; and (b) to determine different segments of consumers based on their preferences. In addition, we explored how familiarity with a claim influences consumers' food choices. The importance of various product attributes (presence or absence of a claim, different sugar and fat content) on consumers' yoghurt preference was measured using conjoint analysis. A base product (fruit yoghurt) was carefully selected to enable wide and realistic variations in the nutritional parameters and the use of different claims.

2. Material and methods

2.1. Data collection

The data were collected via a questionnaire administered to 390 consumers. The survey was carried out by six researchers in different regions of Slovenia to assure that both central and non-central parts of the country were covered. Researchers received instructions to select respondents on the basis of sex and age so as to ensure a suitable composition of the final sample. A filter question about the frequency of eating yoghurt was used to screen participants at the beginning of the interview. Participants who answered that they never consume yoghurt ($N = 18$) were excluded from the study. The remaining participants were asked to complete a card-sorting task; 371 participants finished this task and represent the final sample. The study was performed in line with the Code of Ethics of the University of Ljubljana. Participants were interviewed in their homes.

The study had two parts. After the screening question, we performed a conjoint study and participants were asked to sort nine product cards according to their preferences. Second, they completed a questionnaire measuring their knowledge of the active ingredients, self-reported choice criteria, and demographics.

2.2. Conjoint analysis design

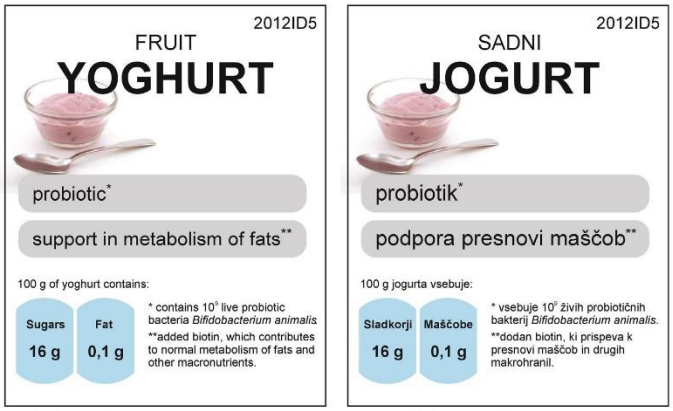
Conjoint analysis is a method used to evaluate the importance individuals assign to various attributes of a product (Green & Srinivasan, 1978). Several studies have employed conjoint analysis to show the effect the trade-offs between health or nutrition claims and sensory or non-sensory factors have on consumers' preferences for choosing a product or determining its healthfulness (Annunziata & Vecchio, 2013; Ares, Gimenez, & Deliza, 2010; Ares, Gimenez, & Gambaro, 2009; Bech-Larsen & Grunert, 2003; Dean et al., 2012; Drewnowski, Moskowitz, Reisner, & Krieger, 2010; Johansen, Naes, Oyaas, & Hersleth, 2010).

The conjoint analysis design entailed four product attributes – two different claims (*probiotic* and *fat metabolism* claims), content of sugars and fat, as shown in Table 1. The full factorial design produced 36 ($2 \times 2 \times 3 \times 3$) profiles. By using an orthogonal fractional factorial design allowing the estimation of main effects only, the number of product cards was reduced to nine. An example of such a product card with both claims is shown in Fig. 1. The participants had to rank the cards according to their preferences from 1 (most favourable) to 9 (least favourable).

The base product of this study was fruit yoghurt given that it is widely consumed around the world. As a good source of nutrients,

Table 1
Attributes of yoghurts and their levels used in the conjoint analysis.

Attribute	Attribute levels
Claim "*support in metabolism of fats*" (hereinafter the *fat metabolism claim*)	Yes No
Claim "*probiotics*" (hereinafter the *probiotic claim*)	Yes No
Sugar content per 100 g of product	4 g 10 g 16 g
Fat content per 100 g of product	0.1 g 1.5 g 3.5 g



English translation Original (Slovenian)

Fig. 1. An example of the stimuli (English translation and original in Slovenian).

yoghurt is recommended in many countries as part of a healthy diet (Eržen, Kač, & Pravst, 2014; Smug, Salminen, Sanders, & Ebner, 2014). Further, due to the common use of claims on yoghurts (Lalor et al., 2010; Pravst et al., 2013) consumers are already familiar with such functional products. Two different claims were tested in our study. The claim "*probiotics*" (hereinafter the *probiotic claim*) is most often used on yoghurts in Slovenia (Pravst et al., 2013) and consumers frequently encounter such claims. Such a claim was visually exposed in the stimuli, and accompanied by a statement in a smaller font noting that the product *contains 10^9 live probiotic bacteria Bifidobacterium animalis*. The second claim made in the stimuli was "*support in metabolism of fats*" (hereinafter the *fat metabolism claim*), accompanied by the words "*added biotin, which contributes to normal metabolism of fats and other macronutrients*", again in a smaller font. This claim is uncommon in the marketplace and was therefore new to most participants. This second claim is also interesting because the health relationship targets fat, a disqualifying nutrient, which was also one of the product attributes we studied.

Sugars and fat are two food constituents consumers pay most attention to when grocery shopping; some consumers stated that low-fat claims have a negative impact on their purchase decision because they expect such products to be less tasteful, while on the contrary many consumers had a positive reaction to products carrying a reduced sugar content claim (Patterson, Sadler, & Cooper, 2012). Nevertheless, both sugars and fat are usually recognised as disqualifying nutrients (Hoefkens et al., 2011) and commonly labelled on nutritional declarations.

2.3. Other measures

After the participants completed the conjoint study, they were presented with a questionnaire concerning their knowledge about probiotics and biotin, statements related to food purchasing decisions and yoghurt choices, and demographics. These measures enable a further insight into our sample of consumers, and are valuable when interpreting their yoghurt preferences.

The respondents' knowledge of biotin and probiotics was measured using a multiple-choice question in which they had to categorise the ingredient as either a mineral, vitamin, microorganism, antioxidant or fibre. Their opinions on statements related to food choices and yoghurts were measured using a 5-point Likert scale (1 – strongly agree; 2 – agree; 3 – neutral; 4 – disagree; 5 – strongly disagree), in most cases with an additional "Don't know" option (Table 2).

Finally, socio-demographic characteristics (age, education, number of household members, and gender) were collected.

2.4. Analysis

Conjoint analysis was conducted with CVA System V2.0 (Sawtooth). Since we used card rankings in our research, relative importance and part-worth utilities were estimated using Monotone regression analysis, which is appropriate for our set of data because it does not assume that the data represent anything more than rank orders.

Following the conjoint analysis, a cluster analysis based on the individual utilities was undertaken to identify groups (clusters) of individuals with similar preferences, but different from individuals in other groups (Müller & Hamm, 2014). To verify the differences amongst clusters in socio-demographic characteristics and consumers' responses in the questionnaire, the chi-square test and analysis of variance were used. Cluster analysis was carried out with the SPSS software (version 13.0).

3. Results

The final sample included 371 participants (47% male and 53% female) with different demographic characteristics: 60% had finished secondary school and 36% had a college degree or higher education. The age of the participants ranged between 14 and 82 years (average age 40.4 years) and the majority (65%) declared that they were solely or jointly responsible for grocery shopping in the household.

The majority of the consumers stated they consumed yoghurt at least a few times a week (68%). Probiotics, a common component of yoghurts in the marketplace, were recognised as microorganisms by 70% of consumers; 63% (strongly) agreed with the statement that probiotic yoghurts are healthier than regular ones (12% disagreed or strongly disagreed) (Table 2). On the contrary, only 37% of the participants were able to recognise biotin as a vitamin and 36% (strongly) agreed with the statement that yoghurts

Table 2
Consumers' opinions on statements related to food choices, yoghurts and their constituents.

Statement	*N*	Mean score[c]	Share (%) of response levels			
			1–2 (%)	3 (%)	4–5 (%)	Don't know (%)
Taste is important when I make food-purchasing decisions[a]	371	1.7	92	6	2	N/A
Probiotic yoghurts are healthier than regular ones.[b]	371	2.4	63	21	12	4
Yoghurts enriched with biotin are healthier than regular ones[b]	369	2.7	36	30	14	20
Yoghurts with a higher fat content taste better[b]	369	2.4	61	11	24	4
Yoghurts with a higher sugar content taste better[b]	370	3.1	37	13	49	1

[a] Measured using a Likert scale 1 (strongly agree) to 5 (strongly disagree) without "Don't know" option.
[b] Measured using a Likert scale 1 (strongly agree) to 5 (strongly disagree) with "Don't know" option.
[c] Mean score excluding consumers which selected "Don't know" option.

enriched with biotin are healthier than regular ones (14% disagreed or strongly disagreed, while 50% were unable to decide).

The majority of consumers (92%) declared that taste is an important parameter when making food purchasing decisions. While 61% of the consumers (strongly) agreed that yoghurts with a higher fat content taste better (24% disagreed or strongly disagreed), only 37% (strongly) agreed that higher sugar levels contribute to a better taste (49% disagreed or strongly disagreed).

3.1. Importance of attributes and their levels

We investigated the importance of nutritional composition and the use of probiotic and fat metabolism claims on consumers' yoghurt preferences. Results of the part-worth utilities of attribute levels and the relative importance of individual attributes are shown in Table 3. Sugar and fat content have the strongest relative importance for the consumers (mean relative importance of 30% and 31%, respectively). The relative importance of the probiotic and the fat metabolism claims was lower, namely 20% for the probiotic claim and 19% for the fat metabolism claim.

Considering the mean part-worth utilities, the consumers generally preferred yoghurts with a low or medium sugar content as opposed to yoghurts with high sugar levels. Surprisingly, a high fat content was a more desirable product attribute than a medium or low fat content. Among the claims, a positive mean part-worth utility was observed for the probiotic claim (+5.2), while a negative one (−11.7) was found for the fat metabolism claim.

3.2. Cluster analysis

Three clusters were derived using Ward's hierarchical cluster analysis with Euclidean distance. Analysis of variance (Kruskal–Wallis test, alpha level: $p = .05$) revealed statistically significant differences between the clusters in the attribute part-worth utilities (Table 4). Such utilities of each attribute of an individual cluster estimated in aggregate at the cluster level are presented in Table 4. The size and socio-demographic characteristics of each cluster are shown in Table 5.

Table 3
The part-worth utilities of attribute levels and the relative importance of individual attributes.

Attribute	Attribute level	Total
Fat metabolism claim	Yes	−11.7
	No	+11.7
	Relative importance (%)[a]	19.0
Probiotic claim	Yes	+5.2
	No	−5.2
	Relative importance (%)[a]	19.9
Sugar content per 100 g of yoghurt	4 g	+9.2
	10 g	+10.6
	16 g	−19.9
	Relative importance (%)[a]	30.4
Fat content per 100 g of yoghurt	0.1 g	−0.2
	1.5 g	−11.4
	3.5 g	+11.6
	Relative importance (%)[a]	30.7

[a] Mean relative importance for each attribute.

As reported in Table 5, cluster 1 was composed of 117 consumers (32%). Those in this cluster preferred yoghurt with a low or medium sugar content, a high fat content and without probiotic and fat metabolism claims; they may be described as *traditional consumers*. Cluster 1 had the biggest share of females (58%).

Considering the preferences, cluster 3 (120 consumers, 32%) is more similar to cluster 1 than cluster 2. Consumers in both cluster 1 and 3 preferred yoghurts without a fat metabolism claim and with a lower sugar content. The main difference between clusters 1 and 3 is the consumers' preference for yoghurts with a probiotic claim, and fat content. Further, consumers in cluster 3 preferred the presence of a probiotic claim and yoghurts with the lowest fat content. The latter is the most important attribute for them, with a mean relative importance of 35%. These consumers may be seen as *health-oriented consumers*.

Consumers in cluster 2 (134 consumers, 36%) also preferred yoghurts with the lowest fat content. Compared to cluster 3, the biggest difference was their preference for yoghurts with a fat metabolism claim, and a high sugar content. Consumers in cluster 2 were the only ones to show a strong preference for yoghurts with the highest sugar content. Only consumers in this cluster preferred both of the tested claims on yoghurts. Hence, they may be described as *claim seekers*. Consumers in clusters 1 and 2 differed in every level of each attribute. The only thing similar between these clusters was the highest relative importance of fat content.

We should note that selecting the number of clusters in cluster analysis is to some extent a question of judgement. If the number of clusters were increased in this study, cluster 1 (traditional consumers) would stay the same due to the participants' homogeneous yoghurt preferences, while the other two clusters could be further classified because of their dispersion and diversity in preferences for yoghurt traits.

4. Discussion

To determine how consumers perceive the presence of claims on products with a different nutritional composition, fruit yoghurt was selected as a base product to enable realistic variations of product attributes. Yoghurt is recommended as part of a healthy diet in many countries, including Slovenia (Eržen et al., 2014; Smug et al., 2014) and is as such considered as a healthy food.

It has previously been shown that consumers have a stronger preference for simple (Bitzios et al., 2011) and more familiar claims (Lahteenmaki et al., 2010). We therefore tested the effect of a familiar (*probiotic*) and an unfamiliar claim (*support in metabolism of fats*), which were visually exposed in the stimuli. We found that, when

Table 4
Part-worth utilities of each attribute per individual cluster.

Attribute	Attribute level	Total	Cluster 1 (traditional consumers)	Cluster 2 (claim seekers)	Cluster 3 (health-oriented consumers)	*p*-value[a]
Fat metabolism claim	Yes	−11.8	−45.0	14.2	−8.3	<.001
	No	11.8	45.0	−14.2	8.3	<.001
	Relative importance[b] (%)	19.0	23.0	17.4	17.0	
Probiotic claim	Yes	5.2	−6.8	9.8	11.9	.001
	No	−5.2	6.8	−9.8	−11.9	.001
	Relative importance[b] (%)	19.9	17.9	19.9	21.6	
Sugar content per 100 g of yoghurt	4 g	9.2	23.2	−28.2	37.4	<.001
	10 g	10.8	25.3	−13.7	23.8	<.001
	16 g	−19.9	−48.5	41.9	−61.1	<.001
	Relative importance[b] (%)	30.4	26.1	30.1	35.0	
Fat content per 100 g of yoghurt	0.1%	−0.2	−68.7	26.9	36.4	<.001
	1.5%	−11.4	21.3	−38.3	−13.2	<.001
	3.5%	11.6	47.4	11.5	−23.3	<.001
	Relative importance[b] (%)	30.7	33.0	32.6	26.3	

[a] Highly significant differences ($p < .001$).
[b] Mean relative importance for each attribute.

Table 5
Size and characteristics of the clusters.

	Total	Cluster 1	Cluster 2	Cluster 3	*p*-value[a]
Cluster size	371	117 (32%)	134 (36%)	120 (32%)	
Gender					
Female	196 (53%)	68 (58%)	70 (52%)	58 (48%)	.316
Male	175	49	64	62	
Female/male ratio	1.12	1.39	1.09	0.94	
Average age	39.4	38.3	40.4	39.4	.592
Education					
Primary school	4%	6%	1%	4%	.236
High school	60%	55%	69%	56%	
Undergraduate	16%	17%	15%	17%	
Postgraduate	20%	22%	14%	23%	
Average number of household members	3.36	3.44	3.19	3.48	.405
Biotin correctly identified as a vitamin	37%	40%	37%	35%	.629
Probiotics correctly identified as microorganisms	70%	72%	72%	64%	.264

[a] No significant differences ($p > .05$).

making a decision on which yoghurt to select, for the majority of the consumers the content of fat and sugar in yoghurt is more important than the two tested claims. This indicates that the potential of disqualifying nutrients to influence consumers' food preferences is stronger than both unfamiliar and familiar tested claims, also when used on a relatively healthy base product such as yoghurt. The reason behind this might lie in consumers' independent interpretation of claims and nutritional composition information when making nutrition-related decisions (Garretson & Burton, 2000). However, we should mention that due to the conjoint design that was used (the number of nutrient attributes' levels was higher than the number of claims' levels) the results might be biased toward the nutrient composition.

We found that the consumers generally avoided yoghurts with the biotin-related fat metabolism claim. One main reason for such behaviour might be unfamiliarity with the tested claim and biotin itself. Namely, only 37% of the respondents were able to identify biotin as a vitamin and only 36% (strongly) agreed with the statement that yoghurts enriched with biotin are healthier than regular ones. Results from other studies also indicate consumers' unwillingness to accept a claim when they are unfamiliar with it (Lahteenmaki et al., 2010; Lin, 2008). Further, incomprehensible expressions and concepts can be confusing to consumers, which can negatively affect their food choice (Brunsø, Fjord, & Grunert, 2002; Svederberg, 2002). However, by using cluster analysis, we determined that there are consumers who are willing to accept unfamiliar claims. Respondents in cluster 2 (comprising 36% of the participants) favoured the fat metabolism claim, although 63% of them were unable to identify biotin as a vitamin, underlining that consumers differ in their preferences for health claims, even when these are unfamiliar.

On the contrary, the majority (70%) of our participants recognised probiotics as microorganisms. We should note that, to minimise the influence on the participants, this was measured after the sorting task (which included a card where the probiotic claim was accompanied by a note stating that yoghurt contains live probiotic bacteria; Fig. 1). Nevertheless, consumers are frequently exposed to probiotic claims, either on the labels of yoghurts and other functional foods, or by strong commercial advertising and even media reports (Annunziata & Vecchio, 2013; Pravst et al., 2013). Therefore, their familiarity with probiotics was expected. In addition, our survey showed that 63% of the respondents (strongly) agreed with the statement that probiotic yoghurts are healthier than those without probiotics. Consumers' prior knowledge of probiotics can be expected to affect their preferences for the probiotic claim. Interestingly, familiarity with probiotics does

not necessarily result in a higher positive part-worth utility for the probiotic claim. While consumers in cluster 2 showed a preference for the probiotic claim, those in cluster 1 had a negative preference for it, even though consumers in both clusters had a high familiarity with probiotics. Similarly, Bruhn et al. (2002) observed that some consumers believe that the consumption of probiotic yoghurts can be beneficial while others believed this to be unnecessary since a balanced diet is sufficient for the human body to function normally. These observations confirm conclusions that consumers' reactions to claims are strongly connected not only to their familiarity and knowledge of the constituent with a claimed effect, but also to their general interest in healthy eating generally, in specific food products (Brunsø et al., 2002; Lahteenmaki, 2013), and to their own subjective theories of health.

In many countries, including Slovenia, lowering the dietary intake of sugars and fat has become a major public health priority and is usually included in national dietary guidelines (Baghurst, 2007). The health risks of high sugar and fat intake are also commonly communicated in the mass media, and in public health campaigns. In addition, particularly the fat content of yoghurts was shown to have a major effect on consumers' healthfulness perception of yoghurt labels (Ares et al., 2013). Based on this, we expected the consumers would generally prefer yoghurts with a lower sugar and fat content. Considering the part-worth utilities for the entire sample ($n = 371$), the consumers' preference for yoghurts with a low/medium sugar content is consistent with previous reports (Chollet, Gille, Schmid, Walther, & Piccinali, 2013). Even though the consumers generally preferred yoghurts with a lower sugar content, consumers in cluster 2 favoured yoghurts with the highest sugar content. Further, sugar content was second most important attribute for them when choosing a yoghurt (mean relative importance of 30.1%).

Surprisingly, the consumers generally preferred yoghurts with high fat content. Several reasons might explain this preference, including their taste-related expectations; 92% of the consumers in our study stated that taste is an important criterion when choosing a food product and 61% (strongly) agreed that yoghurts with a higher fat content taste better. It was previously reported that consumers are generally not prepared to trade taste for health (Verbeke, 2006). In addition, they believe that removing something from a food product results in counterbalancing by adding something else to preserve the taste. Moreover, many consumers tend to choose products with a higher fat content out of habit (Chan, Patch, & Williams, 2005). Hence, consumers are probably aware that 3.5% is the normal amount of fat in yoghurts and anything less could compromise the sensory traits. We should also note that the variation in the tested fat levels (0.1–3.5 g) was lower than in the tested sugar levels (1.5–16 g).

The cluster analysis provided us with further insight into this issue; we showed that the *traditional consumers* in cluster 1 preferred high fat yoghurts, while consumers in the other two clusters preferred low fat yoghurts. In addition, the *traditional consumers* (-cluster 1) disregarded any claims on yoghurt. The most important attribute for them was fat at a level of 3.5%. These consumers might be sceptical about adding different active ingredients to the yoghurt; therefore, the most suitable yoghurt for them is one without any claims, with a high fat and low to medium sugar content. Even though the content of sugar and fat were the most important attributes for the *claim seekers* (cluster 2), they were also willing to accept both of the tested claims. This segment of consumers stands out the most based on their health claim preference. *Health oriented consumers* (cluster 3) preferred a lower fat and sugar content and they might thus be more susceptible to nutrition claims.

Claim seekers are the most willing to accept yoghurts enriched with active ingredients and, most importantly, they could be influenced by health claims. If healthier yoghurt carries a claim, this segment of consumers would likely make healthier choices. On the contrary, if less healthy yoghurt is labelled with a claim, these consumers could be misled to select a less healthy product. Such risks can be avoided if the use of health claims is only allowed on foods with an overall good nutritional composition. Nutrient profiling is already used to assure this in some countries, for example in Australia and New Zealand (Devi et al., 2014), and our results show that it would also be useful to implement nutrient profiles in the European Union.

The present study was conducted using an experimental design involving a manipulated composition of yoghurts and the use of cards in a sorting task. However, the product attributes (including fat and sugar levels) were carefully selected to reflect the composition of yoghurts in the marketplace. Presenting yoghurts on cards does not reflect a real-life situation for consumers and limits their ability to interact with a product. The visual field on the actual yoghurts differs from the yoghurts presented on the cards where all the information could be seen by the consumers without the need to further handle the product. Reflecting the objective of the study to determine how consumers perceive the presence of claims on products with a different nutritional composition, we deliberately excluded the brand name, price and other product attributes, but we should note that in practice these attributes would critically affect purchasing decisions. The lack of the brand name in particular could result in increased use of the label since consumers are unable to rely on their familiarity with the product (Graham & Jeffery, 2011). In addition, while we tested two different claims (a familiar and a non-familiar one) with yoghurt as a base product, the results cannot be simply extrapolated to the use of other claims and other base products. Further, while use of the orthogonal design enabled us to minimise the number of yoghurt profiles, the limitation of such an approach lies in its inability to estimate interactions between yoghurts with different claims and same nutrient content levels. In addition, the interviews took place at individual respondents' homes, where they were given unlimited time to process the information and rearrange the cards. Due to the shortage of time when shopping, consumers' attention to food labels may decrease (Van Herpen & Van Trijp, 2011) which can influence their buying decisions. However, using product cards without a time limitation can give a clearer image of consumers' preferences for specific information used on food labels. Moreover, consumers tend to look longer at a food label when novel food products are introduced to them (Van Herpen & Van Trijp, 2011).

5. Conclusions

The results suggest that while consumers generally consider the nutrition composition of yoghurt to be more important than the tested claims, some groups of consumers are more sensitive to the use of health-related statements. We also observed that different claims hold very different potential to influence consumers' purchasing decisions. We detected the consumers' general positive preference for (a familiar) probiotic claim, and a negative preference for (a non-familiar) fat metabolism claim. Significant differences in the preferences were observed in specific groups of the consumers. While the *traditional consumers* in cluster 1 preferred yoghurt without the probiotic and the fat metabolism claims, consumers in the other clusters were more susceptible to the use of claims. This should be further researched since these consumers are at a higher risk of being misled to select foods with a poor nutritional composition when they are labelled with health claims. The introduction of nutrient profiles would particularly benefit those groups of more vulnerable consumers.

We believe these results are not only relevant to the field of research of the perception of functional foods, but also support further regulatory decisions related to the use of nutrition and health claims on foods.

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References

Annunziata, A., & Vecchio, R. (2013). Consumer perception of functional foods: A conjoint analysis with probiotics. *Food Quality and Preference, 28*, 348–355.
Ares, G., Gimenez, A., Bruzzone, F., Vidal, L., Antunez, L., & Maiche, A. (2013). Consumer visual processing of food labels: results from an eye-tracking study. *Journal of Sensory Studies, 28*, 138–153.
Ares, G., Gimenez, A., & Deliza, R. (2010). Influence of three non-sensory factors on consumer choice of functional yogurts over regular ones. *Food Quality and Preference, 21*, 361–367.
Ares, G., Gimenez, A., & Gambaro, A. (2009). Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. *Food Quality and Preference, 20*, 50–56.
Baghurst, K. (2007). Nutritional recommendations for the general population. In J. Mann & A. S. Truswell (Eds.), *Essentials of human nutrition*. Oxford: Oxford University Press.
Bech-Larsen, T., & Grunert, K. G. (2003). The perceived healthiness of functional foods – A conjoint study of Danish, Finnish and American consumers' perception of functional foods. *Appetite, 40*, 9–14.
Bitzios, M., Fraser, I., & Haddock-Fraser, J. (2011). Functional ingredients and food choice: Results from a dual-mode study employing means-end-chain analysis and a choice experiment. *Food Policy, 36*, 715–725.
Bonsmann, S. S. G., Celemin, L. F., Larranaga, A., Egger, S., Wills, J. M., Hodgkins, C., et al. (2010). Penetration of nutrition information on food labels across the EU-27 plus Turkey. *European Journal of Clinical Nutrition, 64*, 1379–1385.
Bruhn, C. M., Bruhn, J. C., Cotter, A., Garrett, C., Klenk, M., Powell, C., et al. (2002). Consumer attitudes toward use of probiotic cultures. *Journal of Food Science, 67*, 1969–1972.
Brunsø, K., Fjord, T. A., & Grunert, K. G. (2002). Consumers' food choice and quality perception. University of Aarhus, Aarhus School of Business, University of Aarhus, <https://pure.au.dk/portal/files/32302886/wp77.pdf>. (Accessed 17.12.13).
Cappuccio, F. P., & Pravst, I. (2011). Health claims on foods: Promoting healthy food choices or high salt intake? *British Journal of Nutrition, 106*, 1770–1771.
Chan, C., Patch, C., & Williams, P. (2005). Australian consumers are sceptical about but influenced by claims about fat on food labels. *European Journal of Clinical Nutrition, 59*, 148–151.
Chollet, M., Gille, D., Schmid, A., Walther, B., & Piccinali, P. (2013). Acceptance of sugar reduction in flavored yogurt. *Journal of Dairy Science, 96*, 5501–5511.
Cowburn, G., & Stockley, L. (2005). Consumer understanding and use of nutrition labelling: A systematic review. *Public Health Nutrition, 8*, 21–28.
Cox, D. N., Evans, G., & Lease, H. J. (2008). Australian consumers' preferences for conventional and novel sources of long chain omega-3 fatty acids: A conjoint study. *Food Quality and Preference, 19*, 306–314.
Dean, M., Lampila, P., Shepherd, R., Arvola, A., Saba, A., Vassallo, M., et al. (2012). Perceived relevance and foods with health-related claims. *Food Quality and Preference, 24*, 129–135.
Devi, A., Eyles, H., Rayner, M., Ni Mhurchu, C., Swinburn, B., Lonsdale-Cooper, E., et al. (2014). Nutritional quality, labelling and promotion of breakfast cereals on the New Zealand market. *Appetite, 81*, 253–260.
Diepeveen, S., Ling, T., Suhrcke, M., Roland, M., & Marteau, T. M. (2013). Public acceptability of government intervention to change health-related behaviours: A systematic review and narrative synthesis. *BMC Public Health, 13*, 756.
Draper, A. K., Adamson, A. J., Clegg, S., Malam, S., Rigg, M., & Duncan, S. (2011). Front-of-pack nutrition labelling: Are multiple formats a problem for consumers? *The European Journal of Public Health, 23*, 517–521.
Drewnowski, A., Moskowitz, H., Reisner, M., & Krieger, B. (2010). Testing consumer perception of nutrient content claims using conjoint analysis. *Public Health Nutrition, 13*, 688–694.
EC (2006). Commission Regulation (EC) No 1924/2006 of 20 December 2006 on nutrition and health claims made on foods. *Official Journal of the European Union, L404*, 9–25.
EC (2011). Commission Regulation (EU) No 1169/2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004. *Official Journal of the European Union, L304*, 18–63.
Eržen, N., Kač, M., & Pravst, I. (2014). Perceived healthfulness of dairy products and their imitations: Nutrition experts' perspective. *Agro Food Ind. Hi Tech, 25*, 24–27.
Fullmer, S., Geiger, C. J., & Parent, C. R. M. (1991). Consumers knowledge, understanding, and attitudes toward health claims on food labels. *Journal of the American Dietetic Association, 91*, 166–171.
Garretson, J. A., & Burton, S. (2000). Effects of nutrition facts panel values, nutrition claims, and health claims on consumer attitudes, perceptions of disease-related risks, and trust. *Journal of Public Policy & Marketing, 19*, 213–227.
Graham, D. J., & Jeffery, R. W. (2011). Location, location, location: Eye-tracking evidence that consumers preferentially view prominently positioned nutrition information. *Journal of the American Dietetic Association, 111*(11), 1704–1711.
Green, P. E., & Srinivasan, V. (1978). Conjoint analysis in consumer research – Issues and outlook. *Journal of Consumer Research, 5*, 103–123.
Grunert, K. G., Lähteenmäki, L., Boztug, Y., Martinsdottir, E., Ueland, O., Åström, A., et al. (2009). Perception of health claims among Nordic consumers. *Journal of Consumer Policy, 32*, 269–287.
Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health, 15*, 385–399.
Grunert, K. G., Wills, J. M., & Fernandez-Celemin, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite, 55*, 177–189.
Hailu, G., Boecker, A., Henson, S., & Cranfield, J. (2009). Consumer valuation of functional foods and nutraceuticals in Canada. A conjoint study using probiotics. *Appetite, 52*, 257–265.
Hoefkens, C., Verbeke, W., & Van Camp, J. (2011). European consumers' perceived importance of qualifying and disqualifying nutrients in food choices. *Food Quality and Preference, 22*, 550–558.
Johansen, S. B., Naes, T., Oyaas, J., & Hersleth, M. (2010). Acceptance of calorie-reduced yoghurt: Effects of sensory characteristics and product information. *Food Quality and Preference, 21*, 13–21.
Krutulyte, R., Grunert, K. G., Scholderer, J., Lähteenmäki, L., Hagemann, K. S., Elgaard, P., et al. (2011). Perceived fit of different combinations of carriers and functional ingredients and its effect on purchase intention. *Food Quality and Preference, 22*, 11–16.
Lahteenmaki, L. (2013). Claiming health in food products. *Food Quality and Preference, 27*, 196–201.
Lahteenmaki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, O., Astrom, A., et al. (2010). Impact of health-related claims on the perception of other product attributes. *Food Policy, 35*, 230–239.
Lalor, F., Kennedy, J., Flynn, M. A. T., & Wall, P. G. (2010). A study of nutrition and health claims – A snapshot of what's on the Irish market. *Public Health Nutrition, 13*, 704–711.
Lalor, F., Madden, C., McKenzie, K., & Wall, P. G. (2011). Health claims on foodstuffs: A focus group study of consumer attitudes. *Journal of Functional Foods, 3*, 56–59.
Lin, C. T. J. (2008). How do consumers interpret health messages on food labels? *Nutrition Today, 43*, 267–272.
Müller, H., & Hamm, U. (2014). Stability of market segmentation with cluster analysis – A methodological approach. *Food Quality and Preference, 34*, 70–78.
Niva, M., & Mäkelä, J. (2007). Finns and functional foods: Socio-demographics, health efforts, notions of technology and the acceptability of health-promoting foods. *International Journal of Consumer Studies, 31*, 34–45.
Nocella, G., & Kennedy, O. (2012). Food health claims – What consumers understand. *Food Policy, 37*, 571–580.
Patterson, N. J., Sadler, M. J., & Cooper, J. M. (2012). Consumer understanding of sugars claims on food and drink products. *Nutrition Bulletin, 37*, 121–130.
Pravst, I. (2011). Risking public health by approving some health claims? – The case of phosphorus. *Food Policy, 36*, 726–728.
Pravst, I., Kušar, A., Pohar, J., & Klopčič, M. (2013). *Nutrition and health claims on foods in Slovenia*. Ljubljana, Slovenia: Nutrition Institute. doi: 10.13140/2.1.4674.4642.
Pravst, I. (2012). Functional foods in Europe: A focus on health claims. In B. Valdez (Ed.), *Scientific, health and social aspects of the food industry*. http://dx.doi.org/10.13140/2.1.3732.8329.
Roe, B., Levy, A. S., & Derby, B. M. (1999). The impact of health claims on consumer search and product evaluation outcomes: Results from FDA experimental data. *Journal of Public Policy & Marketing, 18*, 89–105.
Signal, L., Lanumata, T., Robinson, J. A., Tavila, A., Wilton, J., & Mhurchu, C. N. (2008). Perceptions of New Zealand nutrition labels by Maori, Pacific and low-income shoppers. *Public Health Nutrition, 11*, 706–713.
Smug, L. N., Salminen, S., Sanders, M. E., & Ebner, S. (2014). Yoghurt and probiotic bacteria in dietary guidelines of the member states of the European Union. *Beneficial Microbes, 5*, 61–66.
Sorenson, D., & Bogue, J. (2005). A conjoint-based approach to concept optimisation: Probiotic beverages. *British Food Journal, 107*, 870–883.
Sparke, K., & Menrad, K. (2009). Cross-European and functional food-related consumer segmentation for new product development. *Journal of Food Products Marketing, 15*, 213–230.
Svederberg, E. (2002). Consumers' views regarding health claims on two food packages. *Forum: Qualitative Social Research, 3*, 1–18.

Svederberg, E., & Wendin, K. (2011). Swedish consumers' cognitive approaches to nutrition claims and health claims. *Food & Nutrition Research, 55*, 1–9.
Van Herpen, E., & Van Trijp, H. C. M. (2011). Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. *Appetite, 57*, 148–160.
Van Trijp, H. C. M., & Van der Lans, I. A. (2007). Consumer perceptions of nutrition and health claims. *Appetite, 48*, 305–324.
Verbeke, W. (2006). Functional foods: Consumer willingness to compromise on taste for health? *Food Quality and Preference, 17*, 126–131.
Verbeke, W. (2010). Consumer reactions to foods with nutrition and health claims. *Agro Food Industry Hi-Tech, 21*, 5–8.
Verbeke, W., Scholderer, J., & Lähteenmäki, L. (2009). Consumer appeal of nutrition and health claims in three existing product concepts. *Appetite, 52*(3), 684–692.
WHO. (2010). Global status report on noncommunicable diseases 2010. WHO, Geneva, <http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf>. (Accessed 17.12.13).
Zezelj, I., Milosevic, J., Stojanovic, Z., & Ognjanov, G. (2012). The motivational and informational basis of attitudes toward foods with health claims. *Appetite, 59*, 960–967.

3 RAZPRAVA IN SKLEPI

3.1 RAZPRAVA

Glavni namen doktorskega dela je bil ugotoviti, kako PT, ZT in simboli vplivajo na izbiro živil pri potrošnikih. Na osnovi pridobljenih podatkov ter postavljenih hipotez, so predstavljene glavne ugotovitve s pojasnili.

Opravili smo več raziskav, ki so nam omogočile vpogled v pogostost označevanja živil s trditvami in simboli ter v označevanje tako označenih živil z drugimi informacijami. Podrobneje smo raziskali seznanjenost potrošnikov s SVŽ. Raziskali smo tudi kakšne asociacije SVŽ izzove pri potrošnikih, kar za ta simbol – kljub njegovi dolgotrajni uporabi – še ni bilo še raziskano. Nadalje nas je zanimalo tudi, kakšne preference imajo potrošniki do različnih simbolov, če jih spremljajo pojasnjevalne trditve. Na primeru jogurta smo raziskali tudi vpliv različnih trditev na izbiro, pri čemer so jogurti vsebovali različne količine nezaželenih hranil (sladkor, maščobe).

3.1.1 Prisotnost trditev in spremljajočih informacij na označbah živil

Nedavni rezultati meta-analize potrjujejo, da se izbira hranilno bolj ustreznih živil lahko značilno poveča, če živila nosijo označbo (Cecchini in Warin, 2016). Potrošnikom, ki jih zanima povezava med živilom in zdravjem, lahko kot dodatna informacija služijo ZT, v kolikor so na označbi navedene informacije, ki potrošniku omogočajo razumevanje tovrstne trditve.

Uporabo PT, ZT in simbolov na predpakiranih živilih smo spremljali v dveh raziskavah. Prva raziskava je bila izvedena v petih evropskih držav (Nemčija, Nizozemska, Slovenija, Španija in Velika Britanija) v letu 2013 (v nadaljevanju evropska raziskava (ER)). V to raziskavo je bilo vključenih 2.034 živil, od tega približno 400 živil iz vsake države. Vzorčenje živil je potekalo naključno. Druga raziskava je bila izvedena v začetku leta 2015 in je vključevala 10.633 predpakiranih živil, ki so bila v času popisa prisotna na slovenskem tržišču (v nadaljevanju slovenska raziskava (SR)). Pri obeh raziskavah je vzorčenje živil potekalo v treh različnih vrstah trgovin (hipermarket, supermarket, diskont) ter pri treh različnih trgovskih družbah.

Rezultati navedenih raziskav zaradi uporabe različnih metod med seboj niso povsem primerljivi. Osnovi namen ER je bil namreč določiti obseg uporabe trditev v širšem evropskem prostoru (in ne na ravni posamezne države), medtem ko je bila SR usmerjena v proučitev stanja v Sloveniji. Ugotovili smo, da je bilo leta 2013 na širšem območju EU s PT označenih 21 % živil, v SR raziskavi smo našli PT na 17 % živil. Večja odstopanja kot pri PT smo ugotovili pri ZT. V ER smo tovrstne trditve našli na 11 % predpakiranih živil,

medtem ko je bil v SR ta delež precej nižji (6 %). Odstopanja so verjetno bolj posledica različnega načina vzorčenja živil, kot pa posledica sprememb na tržišču, ki bi se lahko zgodile v času med obema raziskavama, glede na dejstvo, da je bila EU raziskava opravljena v letu 2013, slovenska raziskava pa v letu 2015.

Zaradi različnih pristopov pri izvedbi tovrstnih raziskav (zajem različnih živilskih kategorij in različen način vključevanja posameznih živil) in različnih časovnih okvirov vzorčenj, je rezultate težko primerjati z drugimi raziskavami, opravljenimi na tem področju. Poleg omenjenih dejstev, ki otežujejo primerjavo, so se v raziskavah uporabljali tudi različni pristopi k analizi pogostosti pojavljanja trditev na živilih. Pri nekaterih raziskavah (kot npr. tudi v obeh naših raziskavah) se je za določanje pogostosti pojavljanja trditev štelo za živilo, ki je označeno s trditvijo, vsako živilo, ki je bilo označeno s trditvijo ali simbolom, s tem da ni bilo pomembno ali živilo nosi eno ali več trditev. Pri nekaterih drugih raziskavah pa se je upoštevalo število vseh trditev na živilih, zato je lahko ugotovljeni delež trditev pri tem načinu proučevanja bistveno večji, saj ima nemalo živil na embalaži navedeno več kot eno trditev. Ne glede na to, pa dobljeni podatki omogočajo vsaj grob vpogled v pogostost označevanja živil s trditvami in simboli v primerjavi z različnimi državami. Predpakiranih živil, označenih s PT, je bilo 46 % v kanadski raziskavi (Schermel in sod., 2013), 7 % v srbski raziskavi (Davidovic in sod., 2015), 29 % v raziskavi opravljeni v Veliki Britaniji (Kaur in sod., 2016), 49 % v ZDA (Colby in sod., 2010), 12 % na Kitajskem (Lv in sod., 2011) in 48 % na Irskem (Lalor in sod., 2010). Rezultati obsežnega popisa živil, opravljenega med leti 2008 in 2009 v 27-ih državah EU in Turčiji, so pokazali, da je povprečno 25 % živil označenih s PT, pri čemer so bile zaznane precejšnje razlike med različnimi državami (Storcksdieck genannt Bonsmann in sod., 2010).

Razlike so opazne tudi glede pogostosti pojavljanja ZT na živilih. Najbolj zanimiva je primerjava podatkov obeh naših raziskav z raziskavo, izvedeno v Sloveniji leta 2011 (Pravst in Kušar, 2015). V tej raziskavi so ugotovili, da so bile ZT prisotne na 13 % predpakiranih živil, kar je precej pogosteje kot v SR, kjer je bilo z ZT označenih 6 % živil. Izpostaviti velja, da je bila v obdobju med obema raziskavama na območju EU v decembru 2012 uveljavljena Uredba komisije (EU) št. 432/2012 o seznamu dovoljenih zdravstvenih trditev na živilih, ki je bistveno zaostrila pogoje uporabe ZT na živilih, kar je verjetno pomembno vplivalo na zmanjšano pogostost uporabe ZT. Zanimiva je tudi primerjava naših podatkov s podatki iz drugih držav. V nedavni srbski raziskavi je delež z ZT označenih živil znašal 6 % (Davidovic in sod., 2015), v britanski 15 % (Kaur in sod., 2016), v ameriški 9 % (Colby in sod., 2010), v irski 18 % (Lalor in sod., 2010), v novozelandsko-avstralski pa je ta delež znašal 14 % (Williams in sod., 2006).

V obeh naših raziskavah smo ugotovili, da se PT najpogosteje pojavljajo v kategoriji živil za posebne prehranske namene (ER: 78 %; SR: 87 %). Tudi podatki o pogostosti pojavljanja PT v drugih kategorijah živil so primerljivi v obeh raziskavah; visoko pogostost pojavljanja

PT smo namreč zasledili tudi v kategorijah žita in žitni proizvodi (ER: 32 %; SR: 34 %), pijače (ER: 30 %; SR: 22 %), mlečni izdelki (ER: 28 %; SR: 23 %) ter jedilna olja in emulzije (ER: 26 %; SR: 31 %). Tudi druge raziskave so pokazale, da so navedene kategorije živil pogosto označene s PT (Al-Ani in sod., 2016; Lalor in sod., 2010; Storcksdieck genannt Bonsmann in sod., 2010). Pri označevanju živil z ZT smo v obeh izvedenih raziskavah ugotovili, da se – podobno kot PT – tudi ZT najpogosteje navajajo na živilih za posebne prehranske namene. Sledile so kategorije jedilna olja in emulzije (ER: 26 %; SR: 11 %), pijače (ER: 17 %; SR: 10 %) ter žita in žitni proizvodi (ER: 16 %; SR 11 %).

V primerjavi s pogostostjo označevanja s PT in ZT smo ugotovili, da je bil s simboli označen manjši delež živil. V ER smo leta 2013 tovrstno označevanje našli pri 4 % živil. Podatki iz te raziskave kažejo, da je bilo s simboli označenih največ živil na Nizozemskem (12 %), medtem, ko je v Sloveniji pogostost s simboli označenih živil znašala 2 %. V SR smo se osredotočili predvsem na uporabo SVŽ, ki smo ga našli le na 1 % predpakiranih živil. V raziskavi iz leta 2011, ki pa ni zajela živil v diskontnih prodajalnah, pa je bil SVŽ prisoten na 2 % označb predpakiranih živil (Pravst in Kušar, 2015). Prisotnost SVŽ smo opazili le v nekaterih kategorijah živil, največ v kategorijah jedilna olja in emulzije (6 %), mlečni izdelki (3 %) ter žita in žitni proizvodi (2 %). Tudi Pravst in Kušar (2015) za leto 2011 navajata največji delež živil označenih s SVŽ v teh kategorijah živil.

Literaturni podatki so zelo skopi glede tega s kakšnimi informacijami so opremljeni izdelki, ki nosijo ZT in PT. V SR smo podrobneje spremljali tudi druge informacije, ki na označbah živil spremljajo trditve in na ta način podpirajo informirano odločitev potrošnika pri izbiri živila. Ugotovili smo, da ima 97 % živil, ki so označena s PT, in 95 % živil, označenih s specifično ZT, označeno tudi HV. Ta delež je višji kot v raziskavi iz leta 2011, kjer je bilo tako označenih le 67 % živil (Pravst in Kušar, 2015). Na Kitajskem je bil ta delež še nižji, saj HV ni imela označene niti polovica živil označenih s PT (Lv in sod., 2011). Podatki za druge države niso razpoložljivi, je pa v mnogih državah (ZDA, Kanada, Avstralija, Nova Zelandija) že dalj časa uveljavljeno obvezno označevanje HV na predpakiranih živilih; od decembra 2016 naprej tudi v EU.

Upoštevajoč zakonodajo morajo imeti živila označena s SZT na označbi navedeno tudi povezano, znanstveno utemeljeno specifično ZT, ki pa smo jo v naši raziskavi našli le na 22 % živilih, označenih s SZT. Ta odstotek je bil nekoliko večji (27 %) pri živilih, označenih z ZT v obliki BTD. Pri tem je potrebno upoštevati, da je razvrščanje živil z BTD med živila z ZT nekoliko subjektivne narave zaradi odsotnosti natančne definicije, kdaj se BTD smatra kot ZT. Poleg tega je do januarja 2022 za blagovne znamke in trgovska imena, ki so obstajala pred letom 2005, v veljavi prehodno obdobje, v času katerega živilom označenim z BTD še ni potrebno izpolnjevati strogih pogojev, ki jih predpisuje Uredba (ES) 1924/2006. V naši raziskavi zato nismo podrobneje obravnavali označevanja živil, označenih z BTD.

Rezultati so pokazali, da je imelo le 29 % živil, označenih s SZT, navedeno HV in izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga. S tem smo potrdili hipotezo 1, da večina živil na tržišču označenih s SZT teh podatkov nima. To lahko predstavlja težavo predvsem za tiste potrošnike, ki potrebujejo večje število informacij za razumevanje trditev (Lahteenmaki, 2015). Tudi zakonodaja, ki ureja označevanje s trditvami navaja, da je potrebno potrošnikom zagotoviti vse informacije, da bodo lahko razumeli učinek, ki ga trditev navaja.

3.1.2 Simbol varovalnega živila in potrošniki

Simboli na živilih lahko vplivajo na prehranske navade posameznikov. Za učinkovitost tovrstnega označevanja živil je pomembno, da so potrošniki s takšnimi simboli seznanjeni in da razumejo njihov pomen. Tudi Resolucija o nacionalnem programu o prehrani in telesni dejavnosti za zdravje 2015 – 2025 med ukrepi izpostavlja vzpostavitev nacionalne sheme označevanja, ki bi potrošnikom omogočila lažjo prepoznavo in izbiro zdravju koristnih živil (MZRS, 2015).

V raziskavi smo se osredotočili predvsem na SVŽ, ki je v Sloveniji prisoten že preko 20 let, raziskovali pa smo tudi SCP in SK, ki sta sicer pogosto prisotna na živilih v nekaterih drugih evropskih državah, zasledili pa smo jih tudi na uvoženih živilih na slovenskem tržišču. Po nam dostopnih podatkih se je intenzivnost promocije SVŽ v zadnjih letih zmanjšala, SCP in SK pa v Sloveniji doslej nista bila promovirana, zato seznanjenosti potrošnikov s tema simboloma nismo pričakovali. Raziskave, ki vključujejo več simbolov, nam omogočajo primerjavo teh simbolov s SVŽ in razumevanje sporočilnosti posameznih simbolov med tistimi potrošniki, ki simbolov ne poznajo. Raziskovali smo seznanjenost potrošnikov s posameznimi simboli, preference do posameznih simbolov in spremljajočih trditev, vrednotenje sporočilnosti posameznih simbolov ter asociacije, ki jih potrošnikom vzbudi SVŽ.

Ugotovili smo, da je 78 % sodelujočih v raziskavi že videlo SVŽ. Kljub temu, da med starostnimi skupinami ni bilo statistično značilnih razlik, so simbol najredkeje opazili najmlajši (18-29 let; 73 %). To je lahko posledica omejene promocije SVŽ predvsem pri tej starostni skupini.

Z metodo asociacije smo ugotovili, da je večina (78 %) sodelujočih opisovala sporočilnost simbola, manjši delež pa je opisoval izključno izgled simbola. Glede na minimalno promocijo SVŽ v zadnjih letih, je bila seznanjenost sodelujočih s simbolom razmeroma visoka. Pri poznavanju simbola gre za dvostopenjski proces, kjer mora biti simbol najprej razpoznan in nato povezan z ustreznim pomenom (Zajonc, 1968). Glede na podatke naše raziskave se je seznanjenost s SVŽ v zadnjih 15-ih letih povečala s približno 40 % (Jan, 2000) na 64 %. Seznanjenost potrošnikov s SVŽ v Sloveniji je bila primerljiva tudi s

seznanjenostjo s simboli uporabljenimi v drugih državah: na Nizozemskem je bilo s SCP seznanjenih 62 – 88 % potrošnikov (Vyth in sod., 2010; Vyth in sod., 2009), na Švedskem pa je bilo s SK seznanjenih 65 % potrošnikov (Larsson in sod., 1999). Podatki raziskave opravljene na Novi Zelandiji so pokazali, da je simbol kljukice (angl. Tick Programme) tudi po 23-ih letih prisotnosti na trgu še vedno pomemben pri spodbudi proizvajalcev živil k razvoju živil z bolj ugodnim profilom hranil, kar ima pozitiven vpliv na prehrano potrošnikov (Thomson in sod., 2016).

Slika srca je pogosto povezana z zdravjem (Carrillo in sod., 2014) in zdravjem srca (Purnhagen in sod., 2015). Življenjski slog ima lahko velik vpliv na zdravje, zato je razumljivo, da je večina sodelujočih v naši raziskavi SVŽ (ki shematično ilustrira srce) povezovala z zdravjem in zdravim življenjskim slogom, kar potrjuje hipotezo 2. Skoraj polovica sodelujočih je SVŽ povezovala s specifičnimi opisi povezanimi z zdravjem (najpogosteje povezanimi s srcem), manj kot tretjina pa je navedla kakršnokoli povezavo simbola s hrano. Povezovanje SVŽ s specifičnimi opisi, povezanimi z zdravjem, je bilo bolj značilno za ženske kot za moške ($p = 0,026$) ter za sodelujoče, ki so predhodno že videli simbol v primerjavi s tistimi, ki ga niso ($p < 0,001$). To je lahko posledica tega, da je večji delež žensk navedel, da so same odgovorne za nakup živil v gospodinjstvu in zato verjetno tudi bolj seznanjene s SVŽ. Tudi rezultati drugih raziskav so pokazali večjo seznanjenost žensk z zdravstvenimi simboli, v primerjavi z moškimi (Lahti-Koski in sod., 2012; Larsson in sod., 1999).

Z uporabo analize sestavljenih učinkov (angl. conjoint analysis (CA)), ki temelji na izbiri med več možnostmi (angl. choice-based conjoint (CBC)), smo želeli preveriti preference sodelujočih do izbranih simbolov (SVŽ, SCP in SK) in več izbranih spremljajočih trditev (»Varuje zdravje«, »Vem, kaj jem«, »Bogat s hranili«, brez trditve). Mehanizmi za obdelavo slik pri človeku se razlikujejo od tistih za obdelavo besedil, zaradi česar lahko slike drugače vplivajo na posameznika in njegovo izbiro (Branthwaite, 2002; Edell in Staelin, 1983). Rezultati naše CBC so pokazali, da so potrošnikom bolj pomembni simboli – ki so slikovni prikazi (relativni pomen atributa je 70,5 %), kot trditve – ki so besedni prikazi (relativni pomen atributa je 29,5 %), kar je skladno z ugotovitvami predhodne raziskave o simbolih in ZT (Carrillo in sod., 2014). Pomembnost simbolov v primerjavi s pomembnostjo trditev je deloma lahko odvisna od osebnega interesa potrošnikov za ohranjanje lastnega zdravja; pri potrošnikih z višjim interesom za ohranjanje zdravja, je značilna bolj podrobna obdelava informacij (trditve imajo lahko posledično večji vpliv), medtem ko gre lahko pri tistih z nižjim tovrstnim interesom za bolj površinsko obdelavo informacij, zato lahko imajo nanje slike večji vpliv (Chrysochou in Grunert, 2014; Turner in sod., 2014). Zaradi pogostejše prisotnosti SVŽ na našem tržišču, je bilo pričakovano, da je preferenca sodelujočih do tega simbola višja (delna korist nivoja je 0,720). Med potrošniki je bil dobro sprejet tudi SCP (delna korist nivoja je 0,315), medtem ko so SK kot znak za označevanje živil potrošniki večinoma zavračali (delna korist nivoja je -1,035). Pogostejše izpostavljanje dražljaju lahko

vpliva na naklonjenost (Zajonc, 1968) in na tvorbo odnosa do le tega, ki je neodvisen od zavestne prepoznave (Hansen in Wänke, 2009). Zato smo izvedli dodatno analizo na udeležencih raziskave, ki niso poznali SVŽ. Preference do posameznih simbolov, merjene z delno koristjo nivojev, se niso bistveno spremenile, zaznali pa smo nekoliko manj izrazite razlike med preferencami do SVŽ in SCP. SK je bil v obeh primerih najmanj zaželen, kar je lahko povezano z dejstvom, da sodelujoči s tem znakom niso seznanjeni, zaradi česar ključavnice niso povezovali z živili z ugodnejšo hranilno sestavo. Tudi rezultati predhodne raziskave so pokazali, da seznanjenost s simbolom na označbi vpliva na pozornost potrošnika (Bialkova in van Trijp, 2010).

Med trditvami, ki so spremljale simbole, sta bili najbolje sprejeti trditvi »Varuje zdravje« (delna korist nivoja je 0,336) in »Vem, kaj jem« (delna korist nivoja je 0,193). Trditev »Varuje zdravje« se je v preteklosti že uporabljala ob SVŽ, preden je leta 2007 stopila v veljavo Uredba 1924/2006 o prehranskih in zdravstvenih trditvah. To je lahko vplivalo tudi na vrednotenje simbolov in trditev med sodelujočimi v naši raziskavi, saj imajo potrošniki pozitivne preference do trditev, ki jih poznajo. Trditev »Bogat s hranili« med potrošniki ni bila zaželena, še manjšo naklonjenost pa so izkazali simbolom, ki jih ni spremljala nobena pojasnjevalna trditev. Rezultati raziskave potrjujejo rezultate predhodnih raziskav (Mejean in sod., 2013), da je potrošnikom pomembna dodatna informacija, ki jim pomaga razumeti simbole. Trditve namreč služijo potrošnikom kot pomoč pri razlagi grafične podobe (Meggs, 1992). Poleg tega so potrošniki mnenja, da so simboli oz. poenostavljeni prikazi HV na sprednji strani embalaže bolj uporabni kot ZT (Talati in sod., 2016).

Kot smo že zapisali je SVŽ predhodno že opazilo 78 % sodelujočih, za ostala simbola pa je bil ta delež mnogo nižji (22 % za SCP in 11 % za SK). Slabša seznanjenost s SCP in SK je bila pričakovana, saj na našem tržišču nista pogosto prisotna. Čeprav je SCP med slovenskimi potrošniki nepoznan, jim je bil izgled simbola enako všeč kot izgled SVŽ. To je nekoliko nenavadno, saj so potrošniki pri asociacijah SCP povezovali z zelo različnimi stvarmi, med katerimi so bile najpogostejše asociacije povezane s soncem, naravo in turizmom. Tudi Wasowicz in sod. (2015) so ugotovili, da imajo potrošniki pozitiven odnos do SCP in ga pogosto povezujejo z zdravjem in naravo. Grafična oblika lahko vpliva na to, da je potrošnik bolj pozoren na specifične dele označbe (Oliveira in sod., 2016). Zato je ne le pri celotni označbi, ampak tudi pri posameznih slikovnih elementih (kot so simboli) potrebno upoštevati, da lahko vizualna podoba simbola vpliva na potrošnikovo pozornost. Naklonjenost do SK je bila nizka, saj potrošniki ne poznajo simbola in njegove sporočilnosti, kar se je pokazalo tudi pri analizi asociacij. SK je bil poleg ključavnice največkrat povezan s figuricami za družabne igre (šah, človek ne jezi se), varnostjo, figuro človeka, itd. Potrošniki SK niso povezovali s hrano ali zdravjem.

V povezavi z izvedbo raziskave velja izpostaviti tudi nekaj omejitev. CBC analiza je bila izvedena tako, da simboli niso bili prikazani na živilih. Ker določene kategorije živil

potrošniki smatrajo kot bolj ali manj koristne za zdravje, bi lahko imelo navajanje simbola na različnih skupinah živil različne vplive na potrošnike. Rezultatov raziskave tudi ni mogoče ekstrapolirati ali posploševati na simbole in trditve, ki niso bili predmet naše raziskave.

3.1.3 Trditve in potrošniki

Potrošniki se različno odzivajo na informacije, ki se pojavljajo na označbi živila. Zato za potrošnike, ki se zanašajo na trditve na živilih, obstaja tveganje, da so zavedeni, v kolikor so trditve prisotne na živilih s hranilno manj ugodno sestavo.

Na jogurtu (predstavljenemu na karticah) smo z metodo CA raziskali hkratni vpliv bolj in manj poznanih trditev ter dveh hranil (sladkor, maščobe) z različnimi količinami na izbiro potrošnikov. Predhodne raziskave so namreč pokazale, da potrošniki nekatera hranila dojemajo kot bolj zaželena (npr. vitamine) ali kot manj zaželena – tista, ki jih je v prehrani potrebno omejiti (npr. maščobe, sladkorji) (Hoefkens in sod., 2011). V našo raziskavo smo vključili dve trditvi; prva je navajala, da izdelek vsebuje probiotik, druga pa, da izdelek nudi podporo presnovi maščob zaradi dodanega biotina. Predpostavljali smo, da je prva trditev potrošnikom bolj poznana, druga pa manj. V predhodnih raziskavah se je izkazalo, da imajo potrošniki raje preproste (Bitzios in sod., 2011) in bolj poznane trditve (Lahteenmaki in sod., 2010).

Potrošnike smo glede na njihove preference do testnih jogurtov, ki smo jih določili s pomočjo CA, razvrstili tudi v skupine. Predhodne raziskave so namreč pokazale, da obstajajo različni segmenti potrošnikov glede na njihove preference, vendar trditve v raziskavah potrošnikom niso bile predstavljene skupaj z zaželenimi ali nezaželenimi hranili (Annunziata in Vecchio, 2013; Cox in sod., 2011; Hailu in sod., 2009; Sparke in Menrad, 2009). Potrošniki so bili razvrščeni v skupine z uporabo metode razvrščanja v skupine (angl. cluster analysis). Na osnovi posameznih naborov koristi so bile oblikovane in poimenovane sledeče skupine:

- »Tradicionalni potrošniki«, ki jim je bila najpomembnejša vsebnost maščob v jogurtu. Najraje so imeli jogurt z največjo vsebnostjo maščobe (3,5 %), medtem ko so odklanjali jogurte z najmanjšo vsebnostjo maščobe (0,1 %). Ravno tako niso sprejeli jogurtov z največjo vsebnostjo sladkorja (16 g) in so raje izbrali jogurte s srednjo (10 g) in majhno (4 g) vsebnostjo. Potrošniki v tej skupini so raje izbrali jogurte brez testiranih trditev, kar pomeni, da so lahko skeptični glede kakršnihkoli dodatkov v jogurt.

- »Zdravstveno-orientirani potrošniki«, ki jim je bila najpomembnejša vsebnost sladkorja v jogurtu, pri čemer so izbirali jogurte z majhnimi vsebnostmi sladkorja.

Tudi pri maščobah so dali prednost jogurtom z najmanjšo vsebnostjo maščob. Pri trditvah so sprejeli le trditev o probiotikih, medtem ko so trditev o presnovi maščob odklanjali. Glede na preference potrošnikov v tej skupini bi lahko bili le ti bolj naklonjeni PT kot ZT.

- »Iskalci trditev«, so bili edini, ki so bili naklonjeni obema trditvama, zaradi česar ta skupina tudi najbolj izstopa. Bili so tudi edini, ki so zavračali jogurt z majhno vsebnostjo sladkorja, najraje pa so izbrali jogurt z največjo vsebnostjo sladkorja. Nekoliko drugačne so bile preference pri vsebnosti maščob, saj so najraje izbrali jogurt z najmanjšo vsebnostjo maščob, temu pa so sledili jogurti z največjo vsebnostjo maščob.

Pri obravnavi rezultatov CA kot celote, smo ugotovili, da je bila pri izbiri potrošnikom bolj kot trditev pomembna informacija o vsebnosti sladkorja in maščob. Maščobe in sladkor lahko razvrstimo med manj zaželena hranila, saj njihovo prekomerno uživanje predstavlja tveganje za razvoj različnih kroničnih nenalezljivih bolezni. S tem povezana tveganja so pogosto omenjena tudi v javnosti, v sklopu različnih programov osveščanja prebivalstva. Vsebnost maščob v jogurtih vpliva tudi na percepcijo potrošnikov o tem, za kako zdravo živilo gre (Ares in sod., 2013). Pričakovali smo, da bodo potrošniki dali prednost jogurtom z manjšo vsebnostjo maščob in sladkorja. V primeru sladkorja se je izkazalo, da potrošniki raje izberejo jogurt z nekoliko manjšo vsebnostjo sladkorja, kar je skladno z rezultati predhodne raziskave (Chollet in sod., 2013). Edina skupina sodelujočih, ki je pri izbiri dala prednost jogurtom z največjo vsebnostjo sladkorja je bila skupina »iskalcev trditev«. V drugih dveh skupinah jogurti z največjo vsebnostjo sladkorja niso bili zaželeni, so pa »zdravstveno-orientirani potrošniki« prednost namenili jogurtom z najmanjšim deležem sladkorja. To je tudi edina skupina potrošnikov, ki je dala prednost jogurtom z najmanjšo vsebnostjo maščob (0,1 %), do ostalih pa ni bila naklonjena. V splošnem so potrošniki pokazali naklonjenost do jogurtov z največjo vsebnostjo maščob (3,5 %), kar je lahko povezano s pričakovanim okusom in aromo. Namreč 92 % potrošnikov je označilo, da na njihov nakup živila vpliva to, da je živilo dobrega okusa. Poleg tega je 61 % potrošnikov navedlo tudi, da so jogurti z več maščobe boljšega okusa. Tudi Verbeke (2006) je ugotovil, da se v splošnem potrošniki niso pripravljeni odreči dobremu okusu v zamenjavo za bolj zdravo alternativo živila, saj so mnenja, da v kolikor se nekaj vzame iz živila, se to kompenzira z dodatkom ali s povečanjem drugega hranila v živilu. Potrošniki pogosto izberejo živilo z večjo vsebnostjo maščobe tudi iz navade (Chan in sod., 2005).

Pri uporabi trditev na jogurtu so se med sodelujočimi pokazale različne preference. Trditev povezana z biotinom (o podpori presnovi maščob) med potrošniki ni bila sprejeta, saj je delna korist za to trditev -11,7. To je lahko povezano z nepoznavanjem biotina, saj ga je le 37 % sodelujočih ustrezno identificiralo kot vitamin. Poleg tega se je le 36 % sodelujočih strinjalo, da so jogurti z dodatkom biotina bolj zdravi od običajnega jogurta. Rezultati so

skladni z ugotovitvami drugih raziskav, kjer so pokazali, da potrošniki ne sprejmejo nepoznanih trditev (Lahteenmaki in sod., 2010; Lin, 2008). Kljub temu, smo med sodelujočimi v skupini »iskalci trditev«, opazili naklonjenost do manj poznane trditve povezane z biotinom. V tej skupini namreč 63 % sodelujočih ni vedelo, da biotin sodi med vitamine.

Nekoliko drugače je bilo pri trditvi povezani s probiotiki. Potrošniki so trditvam na živilih, povezanimi s probiotiki, in njihovemu oglaševanju precej izpostavljeni, prav tako pa vedo kaj so probiotiki (Annunziata in Vecchio, 2013). To se je izkazalo tudi v naši raziskavi, saj je 70 % sodelujočih ustrezno razvrstilo probiotike med mikroorganizme. Skoraj dve tretjini sodelujočih se je strinjalo, da so probiotični jogurti bolj zdravi od običajnih. Kljub temu, da je bila trditev o probiotikih med sodelujočimi pozitivno sprejeta (delna korist nivoja je 5,2), ji vsi potrošniki niso bili naklonjeni. Skupina »tradicionalnih potrošnikov« je kakršnekoli trditve zavračala, ne glede na to ali so bile poznane ali ne. V skupini »zdravstveno-orientiranih potrošnikov« je bila preferenca do jogurta s probiotično trditvijo najvišja, kljub temu, da je bilo poznavanje probiotikov najnižje. Tudi »iskalci trditev« so pozitivno sprejeli omenjeno trditev. To je skladno s predhodnimi ugotovitvami, da nekateri potrošniki smatrajo probiotične jogurte kot učinkovit dodatek v prehrani, medtem ko drugi menijo, da so probiotiki nepotrebni, ker so mnenja, da je najpomembnejša pestra in uravnotežena prehrana brez dodatkov (Bruhn in sod., 2002). Rezultati raziskave potrjujejo, da je odziv potrošnikov na trditve, poleg seznanjenosti in znanja o povezavi med hranilom/snovjo in zatrjevanim učinkom, odvisen tudi od lastnega interesa za zdravo prehranjevanje (Lahteenmaki, 2013; Brunsø in sod., 2002) ter od njihovih lastnih prepričanj o zdravi prehrani.

Potrošniki, ki sodijo v skupino »iskalcev trditev«, bi lahko bili najbolj naklonjeni jogurtom, obogatenim z aktivnimi sestavinami. Nanje bi lahko imele trditve tudi največji vpliv. V primeru, da se trditve pojavijo na jogurtu z ugodnejšo hranilno sestavo, bi ti potrošniki preferenčno izbirali takšna – bolj zdrava – živila. V kolikor pa se trditve pojavijo na jogurtu z bolj neugodno sestavo, pa pri tej skupini potrošnikov obstaja precejšnja možnost, da bodo zaradi trditve zavedeni v nakup manj zdravega živila. Takšnemu tveganju bi se lahko izognili tako, da bi uporabo trditev dovolili izključno na živilih, ki imajo celokupno gledano ugodno hranilno sestavo. Tovrstne omejitve so z vzpostavitvijo modelov za profiliranje živil že uvedli v Avstraliji in Novi Zelandiji (Devi in sod., 2014). Glede na rezultate naše raziskave bi bile tovrstne omejitve smotrne tudi v našem okolju.

Rezultati naše raziskave potrjujejo, da so pri izbiri živil potrošniku pomembnejše informacije o vsebnosti nezaželenih hranil kot ZT na živilu, kar je skladno s hipotezo 3. Vsekakor pa je potrebno upoštevati, da obstajajo različne skupine potrošnikov. Posebno pozornost je potrebno nameniti zlasti tistim, ki so bolj občutljivi na informacije, povezane z zdravjem, na označbah živil. Upoštevati je potrebno tudi, da imajo lahko različne trditve na

potrošnike zelo različen vpliv, pri čemer ne gre zanemariti vpliva skupine živil, ki je predstavljena potrošnikom v raziskavah.

Glede izvedbe raziskave je potrebno izpostaviti tudi nekaj omejitev. Čeprav so bili testirani atributi in nivoji skrbno izbrani, da odražajo realno stanje jogurtov na tržišču, je potrebno upoštevati, da so bile v raziskavi uporabljene kartice z navedbo lastnosti in sliko jogurta, ne pa dejanski jogurti. Poleg tega potrošniki niso imeli informacije o blagovni znamki, ceni itd., zaradi česar so lahko svojo pozornost v večji meri namenili nekaterim elementom na označbi, ki jih sicer lahko ne bi upoštevali. Testirali smo dve različni trditvi, ki pa ju ne moremo posploševati, kar velja tudi za izbiro živila. Intervjuji s potrošniki so potekali v domačem okolju, kjer so si sodelujoči lahko vzeli več časa za razmislek, kot ga imajo med samim nakupovanjem (Van Herpen in Van Trijp, 2011), kar tudi lahko vpliva na izbiro živila.

Rezultati predstavljenih raziskav so poleg pomembnega prispevka k razvoju znanosti, pomembni tudi z vidika javnega zdravja, saj lahko zakonodajalcem omogočijo načrtovanje ustreznih ukrepov za zagotavljanje prehranske varnosti in podpore zdravja prebivalcev. Rezultati raziskav so uporabni tudi za področje živilske tehnologije in za proizvajalce živil, saj podpirajo razvoj tržno uspešnejših živil z ugodnejšo hranilno sestavo.

3.2 SKLEPI

Na osnovi dobljenih rezultatov lahko povzamemo sledeče sklepne ugotovitve:

- V Sloveniji je s PT označenih približno 17 %, z ZT pa približno 6 % predpakiranih živil. Prevladuje uporaba nespecifičnih ZT.

- Zgolj 22 % živil, ki so označena s splošno ZT, spremlja tudi povezana (znanstveno utemeljena) specifična ZT.

- Le 29 % živil, ki so označena s SZT, na označbi navaja tudi podatek o HV živila in izjavo o pomenu pestre in uravnotežene izjave ter zdravega življenjskega sloga.

- Živila, označena s specifičnimi ZT, so bila v 95 % označena tudi s podatki o HV, le v 59 % pa tudi z izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga.

- Večina v raziskavo vključenih potrošnikov pozna SVŽ, še zlasti tisti, ki so v gospodinjstvu odgovorni za nakup živil. Pogosto so navedli, da so SVŽ opazili na živilih in ga povezali z zdravjem in zdravim življenjskim slogom.

- Med tremi testiranimi simboli, je bila med potrošniki najvišja preferenca do SVŽ ob spremljajoči trditvi »Varuje zdravje«, medtem ko je bila najmanj zaželena kombinacija SK in odsotnost pojasnjevalne trditve ob simbolu.

- Na primeru jogurtov smo pokazali, da so pri izbiri živila potrošniku bolj kot ZT pomembne informacije o vsebnosti nezaželenih hranil (sladkor, maščobe).

- Ugotovili smo, da lahko glede preferenc do trditev potrošnike razdelimo v več segmentov. Približno tretjino, v raziskavo vključenih sodelujočih, lahko razvrstimo v skupino »iskalcev trditev«, pri katerih smo ugotovili značilen pozitiven odnos do testiranih ZT.

4 POVZETEK (SUMMARY)

4.1 POVZETEK

Zdravje človeka je povezano tudi s prehrano, saj lahko način prehranjevanja posameznika deluje kot dejavnik tveganja za razvoj številnih bolezni ali kot zaščitni dejavnik, ki izboljša kakovost življenja (WHO, 2014; Diepeveen in sod., 2013). Izbira ustreznih živil je tako ključnega pomena, kar pa otežujejo razna oglaševanja na živilih, vse večja ponudba živil ter karakteristike posameznika (Cannoosamy in Jeewon, 2016; Lahti-Koski in sod., 2012; Nocella in Kennedy, 2012). Zato je poleg spremljanja informacij na živilih pomembno tudi razumeti, kako le te vplivajo na potrošnike.

Uporabo trditev smo spremljali na označbah predpakiranih živil na tržišču. V evropski raziskavi (ER), ki smo jo izvedli leta 2013 v petih evropskih državah, smo pregledali 2.034 živil, leta 2015 pa v Sloveniji izvedli obsežnejšo raziskavo (slovenska raziskava (SR)), v katero je bilo vključenih 10.633 živil. Ugotavljali smo pogostost prisotnosti prehranskih (PT) in zdravstvenih (ZT) trditev ter simbolov na označbi živil. V ER je bilo s PT označenih 21 %, z ZT 11 % in s simboli 2 % živil, v SR pa je bilo s PT označenih 17 %, z ZT 6 % in simbolom varovalnega živila (SVŽ) 1 % živil. V obeh raziskavah smo ugotovili, da se PT najpogosteje pojavljajo v kategoriji živil za posebne prehranske namene (ER: 78 %; SR: 87 %). Visoko pogostost pojavljanja PT smo v obeh raziskavah zasledili tudi med žiti in žitnimi proizvodi (ER: 32 %; SR: 34%), mlečnimi izdelki (ER: 28 %; SR: 23 %), pijačami (ER: 30 %; SR: 22 %) ter pri jedilnih oljih in emulzijah (ER: 26 %; SR: 31 %).

Na podatkih, pridobljenih v SR, smo vrednotili tudi navajanje drugih informacij na označbah živil, zlasti označbo hranilne vrednosti (HV), pri živilih, označenih s splošno zdravstveno trditvijo (SZT), pa tudi prisotnost specifične ZT in izjave o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga. S HV je bilo označenih 97 % živil s PT, 95 % živil s specifično ZT in 82 % živil s SZT. Živila, označena s SZT, je na označbi spremljala specifična ZT le v 22 % primerov. Poleg tega je imelo le 29 % živil, označenih s SZT, na označbi navedeno tudi izjavo o pomenu pestre in uravnotežene prehrane ter zdravega življenjskega sloga in podatke o HV živila.

Označba živila lahko potrošnika informira o posebnih lastnostih živila glede hranilne sestave ali vpliva na zdravje tudi s simboli. V Sloveniji se v ta namen že od leta 1992 uporablja SVŽ. Seznanjenost in dojemanje tega simbola med slovenskimi potrošniki smo raziskovali s spletno raziskavo, v kateri je sodelovalo 1.050 potrošnikov starih od 18 do 60 let. Vprašalnik je bil razdeljen v pet sklopov, ki so vključevali socio-demografske karakteristike, metodo asociacije, seznanjenost s simbolom, analizo sestavljenih učinkov in vrednotenje simbolov na podlagi podanih trditev. Izkazalo se je, da je 78 % sodelujočih SVŽ že videlo, 73 % pa jih je tudi ustrezno navedlo njegov pomen. Analiza asociacij je pokazala, da so potrošniki

pogosteje opisovali sporočilnost simbola, le manjši delež je opisoval njegov izgled. Pri opisih sporočilnosti simbola je bil SVŽ najpogosteje povezan s temami na področju zdravja oz. zdravega življenjskega sloga. Povezovanje SVŽ s specifičnimi opisi, povezanimi z zdravjem, je bilo bolj značilno za ženske kot moške ($p = 0,026$) ter za sodelujoče, ki so že videli simbol v primerjavi s tistimi, ki ga niso ($p < 0,001$).

Rezultati analize sestavljenih učinkov (CA) so pokazali, da so potrošnikom bolj pomembni simboli (relativni pomen atributa je 70,5 %) kot trditve (relativni pomen atributa je 29,5 %). Delne koristi nivojev so pokazale najvišje preference potrošnikov do SVŽ (0,720), sledil mu je simbol Choices Programme (0,315), medtem ko simbolu ključavnice niso bili naklonjeni (-1,035). Med pojasnjevalnimi trditvami, sta bili glede na delno korist nivoja najbolje sprejeti trditvi »Varuje zdravje« (0,336) in »Vem, kaj jem« (0,193). Trditev »Bogat s hranili« med potrošniki ni bila zaželena, še manjšo naklonjenost pa so izkazali simbolom brez trditve. Upoštevajoč uveljavljenost SVŽ med potrošniki lahko simbol predstavlja pomembno izhodišče pri pripravi nacionalne sheme označevanja živil z ugodno hranilno sestavo, predvideno v Resoluciji o nacionalnem programu o prehrani in telesni dejavnosti za zdravje 2015 – 2025 (MZRS, 2015).

V dodatni raziskavi smo raziskali tudi vpliv dveh različnih trditev na potrošnikovo izbiro živil ob prisotnosti nezaželenih hranil (sladkor, maščobe), na primeru jogurta kot modelnega živila. V raziskavo je bilo vključenih 371 naključno izbranih potrošnikov. Potrošniki so bili najprej naprošeni, da razvrstijo devet kartic z različnimi informacijami o jogurtu glede na njihove preference. Kartice so bile oblikovane na podlagi ortogonalnega načrta za CA, kjer so bili prikazani štirje različni atributi (trditev o presnovi maščob, trditev o probiotikih, vsebnost sladkorja, vsebnost maščobe) z različnimi nivoji. Sledil je vprašalnik, v katerega so bila vključena vprašanja o poznavanju aktivnih sestavin, vrednotenje trditev, povezanih z izbiro živil ter jogurtov, in socio-demografski sklop. Manj poznana trditev o vplivu biotina na presnovo maščob je bila med potrošniki nezaželena, kar je lahko posledica slabega poznavanja aktivne sestavine – le 37 % potrošnikov je biotin ustrezno identificiralo kot vitamin. Probiotiki so bili med potrošniki bolje poznani (70 %), kar je lahko vplivalo na pozitivne preference do trditve s probiotiki. Bolj kot testirani trditvi, pa sta na preference potrošnikov vplivali vsebnosti sladkorja in maščob, pri čemer so potrošniki dali prednost jogurtom z nižjo vsebnostjo sladkorja (10 g ali manj) in manjšo vsebnostjo maščob (3,5 %). Z analizo razvrščanja v skupine smo določili tri skupine potrošnikov, in sicer »tradicionalne potrošnike« (prednost so dali jogurtom z večjo vsebnostjo maščobe, manjšo vsebnostjo sladkorja in brez trditev), »iskalce trditev« (prednost so dali jogurtom z različno vsebnostjo maščobe, največjo vsebnostjo sladkorja in z obema trditvama) in »zdravstveno-orientirane potrošnike« (prednost so dali jogurtom z najmanjšo vsebnostjo maščobe, majhno vsebnostjo sladkorja in le trditvi o probiotikih). Rezultati so pokazali, da trditve na različne potrošnike različno vplivajo, kar je potrebno upoštevati tako v raziskavah, kot tudi pri pripravi zakonodaje in komunikaciji tovrstnih informacij s potrošniki.

4.2 SUMMARY

Nutrition and diet are closely associated with human health since individual's dietary patterns can present a risk factor for many diseases or serve as a protective factor that can improve quality of life (WHO, 2014; Diepeveen et al., 2013). Food choices, therefore, represent a key element regarding our health. Nowadays, choosing the right foods has become difficult due to intense advertising, an increasing number of food products, and individual's preferences (Cannoosamy and Jeewon, 2016; Lahti-Koski et al., 2012; Nocella and Kennedy, 2012). For this reason, not only the presence of different information on food labels, but also how this information influences the consumers are of great importance.

The presence of claims was evaluated on pre-packed foods on the market. Within the European research (ER) carried out in 2013 in five different European countries, 2034 food items were evaluated, while 10633 food items were inspected as a part of a more extensive study (Slovenian research (SR)) held in Slovenia in 2015. We monitored the prevalence of nutrition (PT) and health (ZT) claims along with the symbols presented on food labels. In ER, 21% of foods were labelled with PT, 11% with ZT, and 2% with symbols; in SR, 17% of foods were labelled with PT, 6% with ZT, while 1% was labelled with the "Protective food" symbol (SVŽ). The highest proportion of foods labelled with PT and ZT in both studies was found in the category of foods for specific dietary use (78% and 87%, respectively). Moreover, a high proportion of foods labelled with PT in both studies were found in several other categories, namely cereals and cereal products (32% and 34%), dairy (28% and 23%), beverages (30% and 22%), and edible oils and emulsions (31% and 26%).

Using the data obtained from the SR, we also analysed the presence of additional information on foods, especially the presence of nutrition declaration (HV), scientifically substantiated ZT, and statements indicating the importance of a varied and balanced diet and a healthy lifestyle for products labelled with general health claim (SZT). HVs were present on 97% of foods labelled with PT, on 95% of foods with specific ZT, and on 82% foods labelled with SZT. Only 22% of foods labelled with SZT were also labelled with scientifically substantiated ZT. Moreover, only 29% of foods labelled with SZT carried both, a statement indicating the importance of a varied and balanced diet and a healthy lifestyle, and HV.

Symbols, presented on food labels can provide valuable information on special properties of the food product, either regarding nutritional composition or potential health benefits. For aforementioned purpose, Slovenia has introduced a so-called SVŽ already back in 1992. Therefore, familiarity and perception of this symbol among Slovenian consumers was studied using an online study which included 1050 consumers aged between 18 and 60 years. The questionnaire consisted of five parts: socio-demographic characteristics, word-association task, symbol recall, conjoint study, and evaluation of symbols based on the statements provided. Results showed that 78% of participants had previously seen the SVŽ,

of which 73% satisfactorily defined its meaning. When describing the symbol, consumers mainly focused on the meaning of the symbol rather than on its appearance. As a part of the symbol's meaning description, most common associations were related to health and healthy lifestyle. Women tended to more commonly relate the symbol to a specific health description in comparison to men ($p = 0.026$). The same trend was observed in people who had seen the symbol before as oppose to those who had not ($p < 0.001$).

Results from conjoint analysis (CA) showed that consumers perceived symbols of greater importance (relative importance was 70.5%) as compared to claims (relative importance was 29.5%). Based on part-worth utilities, consumers' preferences were highest for SVŽ (0.720), followed by Choices programme symbol (0.315), while the Keyhole symbol was not well accepted (-1.035). With regard to accompanying claims, positive part-worth utilities were observed for claims "Protects health" (0.336) and "I know what I eat" (0.193). Claim "Rich in nutrients" was not well accepted; even lower acceptance was observed when no claim was present. Considering the notability of SVŽ among consumers, the symbol has the potential to present an important starting point for the preparation of national scheme for labelling foods with beneficial nutritional values, predicted as a part of the Resolution on the National Programme on Nutrition and Physical Activity for Health 2015 – 2025 (MZRS, 2015).

Additionally, we studied the influence of claims on consumers' food choice in the presence of disqualifying nutrients (sugar, fat) with yoghurt as a base product. The sample included 371 randomly selected consumers. Firstly, consumers were asked to sort nine product cards with different yoghurt information according to their preference. Cards were designed for CA based on orthogonal design with four different attributes (claim about fat metabolism, probiotic claim, sugar content, and fat content). Secondly, they completed a questionnaire measuring their knowledge of the active ingredients, self-reported choice criteria, and demographics. Less familiar claim with biotin was not well accepted by the consumers, which could be explained by the lack of recognition of the active ingredient – only 37% of the participants correctly identified biotin as a vitamin. On the other hand, consumers were more familiar with probiotics (70%), which could have an influential impact on their positive preference for the probiotic claim. Interestingly, the results revealed that sugar and fat content in yoghurt appeared to be a more important factor of choice than the tested claims. Consumers preferred yoghurts with a lower sugar content (10 g or less) and a higher fat content (3.5%). Using cluster analysis, we identified three different groups of consumers: "traditional consumers" (preference for yoghurt with high fat content, lower sugar content, and no claim), "claim seekers" (preference for yoghurt with different fat content, highest sugar content, and both claims), and "health-oriented consumers" (preference for yoghurt with lowest fat content, lower sugar content, and only probiotic claim). The results showed that claims on food items are perceived differently by different groups of consumers, which needs to be taken into consideration when executing such research, as well as in the preparation of legislation and when communicating such information with consumers.

5 VIRI

Al-Ani H.H., Devi A., Eyles H., Swinburn B., Vandevijvere S. 2016. Nutrition and health claims on healthy and less-healthy packaged food products in New Zealand. British Journal of Nutrition, 116, 6: 1087-1094

Andrews C.J., Burton S., Kees J. 2011. Is simpler always better? Consumer evaluations of front-of-package nutrition symbols. Journal of Public Policy & Marketing, 30, 2: 175-190

Annunziata A., Vecchio R. 2013. Consumer perception of functional foods: a conjoint analysis with probiotics. Food Quality and Preference, 28, 1: 348-355

Ares G., Gimenez A., Bruzzone F., Vidal L., Antunez L., Maiche A. 2013. Consumer visual processing of food labels: results from an eye-tracking study. Journal of Sensory Studies, 28, 2: 138-153

Ares G., Gimenez A., Gambaro A. 2009. Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. Food Quality and Preference, 20, 1: 50-56

Ares G., Mawad F., Giménez A., Maiche A. 2014. Influence of rational and intuitive thinking styles on food choice: preliminary evidence from an eye-tracking study with yogurt labels. Food Quality and Preference, 31: 28-37

Aschemann-Witzel J., Maroscheck N., Hamm U. 2013. Are organic consumers preferring or avoiding foods with nutrition and health claims? Food Quality and Preference, 30, 1: 68-76

Babio N., López L., Salas-Salvadó J. 2013. Análisis de la capacidad de elección de alimentos saludables por parte de los consumidores en referencia a dos modelos de etiquetado nutricional; estudio cruzado. Nutrición Hospitalaria, 28, 1: 173-181

Bäckström A., Pirttilä-Backman A.M., Tuorila H. 2004. Willingness to try new foods as predicted by social representations and attitude and trait scales. Appetite, 43, 1: 75-83

Bartels J., Onwezen M.C. 2014. Consumers' willingness to buy products with environmental and ethical claims: the roles of social representations and social identity. International Journal of Consumer Studies, 38, 1: 82-89

Becker M.W., Bello N.M., Sundar R.P., Peltier C., Bix L. 2015. Front of pack labels enhance attention to nutrition information in novel and commercial brands. Food Policy, 56: 76-86

Beckmann S. 2007. Shopping, buying, evaluating and disposing. V: Consumer behaviour: a European perspective. Solomon M., Bamossy G., Askegaard S., Hogg M.K. (eds.). Harlow, Financial Times/Prentice-Hall: 299-348

Besler H.T., Buyuktuncer Z., Uyar M.F. 2012. Consumer understanding and use of food and nutrition labeling in Turkey. Journal of Nutrition Education and Behavior, 44, 6: 584-591

Bettman J.R., Park C.W. 1980. Effects of prior knowledge and experience and phase of the choice process on consumer decision processes: a protocol analysis. Journal of Consumer Research, 7, 3: 234-248

Bialkova S., Grunert K.G., Juhl H.J., Wasowicz-Kirylo G., Stysko-Kunkowska M., Van Trijp H.C. 2014. Attention mediates the effect of nutrition label information on consumers' choice. Evidence from a choice experiment involving eye-tracking. Appetite, 76: 66-75

Bialkova S., Grunert K.G., Van Trijp H. 2013. Standing out in the crowd: the effect of information clutter on consumer attention for front-of-pack nutrition labels. Food Policy, 41: 65-74

Bialkova S., Sasse L., Fenko A. 2016. The role of nutrition labels and advertising claims in altering consumers' evaluation and choice. Appetite, 96: 38-46

Bialkova S., Van Trijp H. 2010. What determines consumer attention to nutrition labels? Food Quality and Preference, 21, 8: 1042-1051

Bitzios M., Fraser I., Haddock-Fraser J. 2011. Functional ingredients and food choice: results from a dual-mode study employing means-end-chain analysis and a choice experiment. Food Policy, 36, 5: 715-725

Branthwaite A. 2002. Investigating the power of imagery in marketing communication: evidence-based techniques. Qualitative Market Research: an International Journal, 5, 3: 164-171

Brecher S.J., Bender M.M., Wilkening V.L., McCabe N.M., Anderson E.M. 2000. Status of nutrition labeling, health claims, and nutrient content claims for processed foods: 1997 food label and package survey. Journal of Amercian Dietetic Association, 100, 9: 1057-1062

Bruhn C.M., Bruhn J.C., Cotter A., Garrett C., Klenk M., Powell C., Stanford G., Steinbring Y., West E. 2002. Consumer attitudes toward use of probiotic cultures. Journal of Food Science, 67, 5: 1969-1972

Brunsø K., Fjord T.A., Grunert K.G. 2002. Consumers' food choice and quality perception. MAPP Working Papers. Aarhus, University of Aarhus, Aarhus School of Business**:** 60 str.

Buckland N.J., Dalton M., Stubbs R.J., Hetherington M.M., Blundell J.E., Finlayson G. 2015. Associations between nutritional properties of food and consumer perceptions related to weight management. Food Quality and Preference, 45: 18-25

Campos S., Doxey J., Hammond D. 2011. Nutrition labels on pre-packaged foods: a systematic review. Public Health Nutrition, 14, 8: 1496-1506

Cannoosamy K., Jeewon R. 2016. A critical assessment of nutrition labelling and determinants of its use and understanding. Progress in Nutrition, 18, 3: 195-204

Carrillo E., Fiszman S., Lähteenmäki L., Varela P. 2014. Consumers’ perception of symbols and health claims as health-related label messages. A cross-cultural study. Food Research International, 62: 653-661

Carrillo E., Varela P., Fiszman S. 2012. Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. Food Research International, 48, 1: 209-216

Cavaliere A., De Marchi E., Banterle A. 2016. Does consumer health-orientation affect the use of nutrition facts panel and claims? An empirical analysis in Italy. Food Quality and Preference, 54: 110-116

Cecchini M., Warin L. 2016. Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies. Obesity Reviews, 17, 3: 201-210

Chan C., Patch C., Williams P. 2005. Australian consumers are sceptical about but influenced by claims about fat on food labels. European Journal of Clinical Nutrition, 59, 1: 148-151

Chollet M., Gille D., Schmid A., Walther B., Piccinali P. 2013. Acceptance of sugar reduction in flavored yogurt. Journal of Dairy Science, 96, 9: 5501-5511

Chrysochou P. 2010. Food health branding: the role of marketing mix elements and public discourse in conveying a healthy brand image. Journal of Marketing Communications, 16, 1-2: 69-85

Chrysochou P., Grunert K.G. 2014. Health-related ad information and health motivation effects on product evaluations. Journal of Business Research, 67, 6: 1209-1217

Colby S.E., Johnson L., Scheett A., Hoverson B. 2010. Nutrition marketing on food labels. Journal of Nutrition Education and Behavior, 42, 2: 92-98

Contini C., Casini L., Stefan V., Romano C., Juhl H.J., Lähteenmäki L., Scozzafava G., Grunert K.G. 2015. Some like it healthy: can socio-demographic characteristics serve as predictors for a healthy food choice? Food Quality and Preference, 46: 103-112

Cowburn G., Stockley L. 2005. Consumer understanding and use of nutrition labelling: a systematic review. Public Health Nutrition, 8, 1: 21-28

Cox D.N., Evans G., Lease H.J. 2011. The influence of product attributes, consumer attitudes and characteristics on the acceptance of: (1) Novel bread and milk, and dietary supplements and (2) fish and novel meats as dietary vehicles of long chain omega 3 fatty acids. Food Quality and Preference, 22, 2: 205-212

Davidovic D.B., Tomic D.V., Paunovic K.Z., Vasiljevic N.D., Jorga J.B. 2015. Nutrition labelling of pre-packaged foods in Belgrade, Serbia: current situation. Public Health Nutrition, 18, 11: 1969-1978

Dean M., Lampila P., Shepherd R., Arvola A., Saba A., Vassallo M., Claupein E., Winkelmann M., Lahteenmaki L. 2012. Perceived relevance and foods with health-related claims. Food Quality and Preference, 24, 1: 129-135

DeRosia E.D. 2008. The effectiveness of nonverbal symbolic signs and metaphors in advertisements: an experimental inquiry. Psychology and Marketing, 25, 3: 298-316

Devi A., Eyles H., Rayner M., Ni Mhurchu C., Swinburn B., Lonsdale-Cooper E., Vandevijvere S. 2014. Nutritional quality, labelling and promotion of breakfast cereals on the New Zealand market. Appetite, 81: 253-260

Diepeveen S., Ling T., Suhrcke M., Roland M., Marteau T.M. 2013. Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis. BMC Public Health, 13: 1-11

Draper A.K., Adamson A.J., Clegg S., Malam S., Rigg M., Duncan S. 2011. Front-of-pack nutrition labelling: are multiple formats a problem for consumers? The European Journal of Public Health, 23, 3: 517-521

Društvo za zdravje srca in ožilja Slovenije. 2007. Pravilnik o pogojih podeljevanja pravice do uporabe kolektivne blagovne/storitvene znamke Društva za zdravje srca in ožilja Slovenije. Ljubljana, Društvo za zdravje srca in ožilja Slovenije: 25 str. http://zasrce.si/clanek/i230/ (maj, 2017)

Dunford E., Webster J., Metzler A.B., Czernichow S., Ni Mhurchu C., Wolmarans P., Snowdon W., L'Abbe M., Li N., Maulik P.K., Barquera S., Schoj V., Allemandi L., Samman N., de Menezes E.W., Hassell T., Ortiz J., Salazar de Ariza J., Rahman A.R., de Nunez L., Garcia M.R., van Rossum C., Westenbrink S., Thiam L.M., MacGregor G., Neal B. 2012. International collaborative project to compare and monitor the nutritional composition of processed foods. European Journal of Preventive Cardiology, 19, 6: 1326-1332

EC. 2016. EU Register of nutrition and health claims made on foods. Bruselj, European Commission: 1 str. http://ec.europa.eu/food/safety/labelling_nutrition/claims/register/public/?event=register.home&CFID=3525587&CFTOKEN=2d7353d118050493-E944A1A0-971F-E091-4B1EC2B1502C444A (maj, 2017)

Edell J.A., Staelin R. 1983. The information processing of pictures in print advertisements. Journal of Consumer Research, 10, 1: 45-61

Emrich T.E., Mendoza J.E., L'Abbe M.R. 2012. Effectiveness of front-of-pack nutrition symbols: a pilot study with consumers. Canadian Journal of Dietetic Practice and Research, 73, 4: 200-203

Emrich T.E., Qi Y., Mendoza J.E., Lou W., Cohen J.E., L'Abbe M.R. 2014. Consumer perceptions of the nutrition facts table and front-of-pack nutrition rating systems. Applied Physiology Nutrition, and Metabolism, 39, 4: 417-424

EUFIC. 2009. Food-based dietary guidelines in Europe. EUFIC Review, 10: 1-23

Fenko A., Kersten L., Bialkova S. 2016. Overcoming consumer scepticism toward food labels: the role of multisensory experience. Food Quality and Preference, 48, Part A: 81-92

Feunekes G.I.J., Gortemaker I.A., Willems A.A., Lion R., Van den Kommer M. 2008. Front-of-pack nutrition labelling: Testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite, 50, 1: 57-70

Finkelstein S.R., Fishbach A. 2010. When healthy food makes you hungry. Journal of Consumer Research, 37, 3: 357-367

Fitzsimons G.J., Hutchinson J.W., Williams P., Alba J.W., Chartrand T.L., Huber J., Kardes F.R., Menon G., Raghubir P., Russo J.E., Shiv B., Tavassoli N.T. 2002. Non-conscious influences on consumer choice. Marketing Letters, 13, 3: 269-279

Fullmer S., Geiger C.J., Parent C.R.M. 1991. Consumers knowledge, understanding, and attitudes toward health claims on food labels. Journal of the American Dietetic Association, 91, 2: 166-171

Goodman S., Hammond D., Pillo-Blocka F., Glanville T., Jenkins R. 2011. Use of nutritional information in Canada: national trends between 2004 and 2008. Journal of Nutrition Education and Behavior, 43, 5: 356-365

Grover R., Srinivasan V. 1987. A simultaneous approach to market segmentation and market structuring. Journal of Marketing Research, 24, 2: 139-153

Grunert K.G., Scholderer J., Rogeaux M. 2011. Determinants of consumer understanding of health claims. Appetite, 56, 2: 269-277

Grunert K.G., Wills J.M. 2007. A review of European research on consumer response to nutrition information on food labels. Journal of Public Health, 15, 5: 385-399

Grunert K.G., Wills J.M., Fernandez-Celemin L. 2010. Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. Appetite, 55, 2: 177-189

Hailu G., Boecker A., Henson S., Cranfield J. 2009. Consumer valuation of functional foods and nutraceuticals in Canada. A conjoint study using probiotics. Appetite, 52, 2: 257-265

Hansen J., Wänke M. 2009. Liking what's familiar: the importance of unconscious familiarity in the mere-exposure effect. Social Cognition, 27, 2: 161-182

Hellyer N.E., Fraser I., Haddock-Fraser J. 2012. Food choice, health information and functional ingredients: an experimental auction employing bread. Food Policy, 37, 3: 232-245

Hess R., Visschers V.H.M., Siegrist M. 2012. The role of health-related, motivational and sociodemographic aspects in predicting food label use: a comprehensive study. Public Health Nutrition, 15, 3: 407-414

Hewstone M., Jaspars J.M.F. 1984. Social dimensions of attribution. V: The social dimension: European developments in social psychology, Vol. 2. Tajfel H. (ed.). Cambridge, Cambridge University Press: 379-404

Hoefkens C., Verbeke W., Van Camp J. 2011. European consumers' perceived importance of qualifying and disqualifying nutrients in food choices. Food Quality and Preference, 22, 6: 550-558

IoM. 2012. Front-of-package nutrition rating systems and symbols: promoting healthier choices (phase II). Wartella E.A., Lichtenstein A.H., Yaktine A., Nathan R. (eds.). Washington, DC, Institute of Medicine/The National Academies Press: 163 str.

Jacoby J., Speller D.E., Berning C.K. 1974. Brand choice behavior as a function of information load: replication and extension. Journal of Consumer Research, 1, 1: 33-42

Jan N. 2000. Milk and dairy products among health protecting food products. Mljekarstvo, 50: 67-70

Kaur A., Scarborough P., Matthews A., Payne S., Mizdrak A., Rayner M. 2016. How many foods in the UK carry health and nutrition claims, and are they healthier than those that do not? Public Health Nutrition, 19, 6: 988-997

König L.M., Giese H., Stok F.M., Renner B. 2017. The social image of food: associations between popularity and eating behavior. Appetite, 114, 1: 248-258

Köster E.P., Mojet J. 2007. Theories of food choice development V: Understanding consumers of food products. Frewer L.,Van Trijp H. (eds.). Cambridge, Woodhead Publishing**:** 93-124

Krutulyte R., Grunert K.G., Scholderer J., Lähteenmäki L., Hagemann K.S., Elgaard P., Nielsen B., Graverholt J.P. 2011. Perceived fit of different combinations of carriers and functional ingredients and its effect on purchase intention. Food Quality and Preference, 22, 1: 11-16

Kušar A., Pravst I. 2014. Quality and safety of botanical food products and their labelling. Agro Food Industry Hi-Tech, 25, 2: 33-37

Lahteenmaki L. 2013. Claiming health in food products. Food Quality and Preference, 27, 2: 196-201

Lahteenmaki L. 2015. Consumer interpretation of nutrition and other information on food and beverage labels. V: Advances in food and beverage labelling. Berryman P. (ed.). Oxford, Woodhead Publishing**:** 133-148

Lahteenmaki L., Lampila P., Grunert K., Boztug Y., Ueland O., Astrom A., Martinsdottir E. 2010. Impact of health-related claims on the perception of other product attributes. Food Policy, 35, 3: 230-239

Lahti-Koski M., Helakorpi S., Olli M., Vartiainen E., Puska P. 2012. Awareness and use of the Heart Symbol by Finnish consumers. Public Health Nutrition, 15, 3: 476-482

Lalor F., Kennedy J., Flynn M.A.T., Wall P.G. 2010. A study of nutrition and health claims - a snapshot of what's on the Irish market. Public Health Nutrition, 13, 5: 704-711

Lalor F., Madden C., McKenzie K., Wall P.G. 2011. Health claims on foodstuffs: a focus group study of consumer attitudes. Journal of Functional Foods, 3, 1: 56-59

Larsson I., Lissner L., Wilhelmsen L. 1999. The 'Green Keyhole' revisited: nutritional knowledge may influence food selection. European Journal of Clinical Nutrition, 52: 776-780

Latortue K.Y., Weber J.A. 2010. Taking a closer look at nutrition symbols on food labels. Journal of the American Dietetic Association, 110, 4: 517-519

Leathwood P.D., Richardson D.P., Strater P., Todd P.M., van Trijp H.C.M. 2007. Consumer understanding of nutrition and health claims: sources of evidence. British Journal of Nutrition, 98, 3: 474-484

Legault L., Brandt M.B., McCabe N., Adler C., Brown A.M., Brecher S. 2004. 2000-2001 food label and package survey: an update on prevalence of nutrition labeling and claims on processed, packaged foods. Journal of the American Dietetic Association, 104, 6: 952-958

Lin C.T.J. 2008. How do consumers interpret health messages on food labels? Nutrition Today, 43, 6: 267-272

Loebnitz N., Schuitema G., Grunert K.G. 2015. Who buys oddly shaped food and why? Impacts of food shape abnormality and organic labeling on purchase intentions. Psychology & Marketing, 32, 4: 408-421

Lv J., Chen Y., Wang S., Liu Q., Ren Y., Karrar S., Li L. 2011. A survey of nutrition labels and fats, sugars, and sodium ingredients in commercial packaged foods in Hangzhou, China. Public Health Reports, 126, 1: 116-122

Mackison D., Wrieden W.L., Anderson A.S. 2010. Validity and reliability testing of a short questionnaire developed to assess consumers' use, understanding and perception of food labels. European Journal of Clinical Nutrition, 64, 2: 210-217

Magnusson M.K., Arvola A., Hursti U.K., Aberg L., Sjoden P.O. 2003. Choice of organic foods is related to perceived consequences for human health and to environmentally friendly behaviour. Appetite, 40, 2: 109-117

Mawad F., Trías M., Giménez A., Maiche A., Ares G. 2015. Influence of cognitive style on information processing and selection of yogurt labels: Insights from an eye-tracking study. Food Research International, 74: 1-9

Meggs P.B. 1992. Type and image: the language of graphic design. New York, Van Nostrand Reinhold: 208 str.

Mejean C., Macouillard P., Péneau S., Hercberg S., Castetbon K. 2013. Consumer acceptability and understanding of front-of-pack nutrition labels. Journal of Human Nutrition and Dietetics, 26, 5: 494-503

Moscovici S. 2001. Why a theory of social representations? V: Representations of the social: bridging theoretical traditions. Deaux K., Philogene G. (eds.). Oxford, Wiley-Blackwell: 8-35

MZRS. 2015. Resolucija o nacionalnem programu o prehrani in telesni dejavnosti za zdravje 2015 – 2025. Ljubljana, Ministrstvo za zdravje RS: 63 str. http://www.mz.gov.si/fileadmin/mz.gov.si/pageuploads/javna_razprava_2015/Resolucija_o_nac_programu_prehrane_in_in_tel_dejavnosti_jan_2015.pdf (maj, 2017)

Neuman N., Persson Osowski C., Mattsson Sydner Y., Fjellstrom C. 2014. Swedish students' interpretations of food symbols and their perceptions of healthy eating. An exploratory study. Appetite, 82: 29-35

Niva M., Mäkelä J. 2007. Finns and functional foods: socio-demographics, health efforts, notions of technology and the acceptability of health-promoting foods. International Journal of Consumer Studies, 31, 1: 34-45

Nocella G., Kennedy O. 2012. Food health claims – what consumers understand. Food Policy, 37, 5: 571-580

Oliveira D., Machín L., Deliza R., Rosenthal A., Walter E.H., Giménez A., Ares G. 2016. Consumers' attention to functional food labels: insights from eye-tracking and change detection in a case study with probiotic milk. LWT - Food Science and Technology, 68: 160-167

Orquin J.L., Scholderer J. 2015. Consumer judgments of explicit and implied health claims on foods: misguided but not misled. Food Policy, 51: 144-157

Petrovici D., Fearne A., Nayga J., Rodolfo M., Drolias D. 2012. Nutritional knowledge, nutritional labels, and health claims on food: a study of supermarket shoppers in the South East of England. British Food Journal, 114, 6: 768-783

Pokorn D. 2005. O znaku "Varuje zdravje". Za Srce, 14, 2: 11-12

Pothoulaki M., Chryssochoidis G. 2009. Health claims: consumers' matters. Journal of Functional Foods, 1, 2: 222-228

Pravst I., Kušar A. 2015. Consumers' exposure to nutrition and health claims on pre-packed foods: use of sales weighting for assessing the food supply in Slovenia. Nutrients, 7, 11: 9353-9368

Purnhagen K.P., van Herpen E., van Kleef E. 2015. The potential use of visual packaging elements as nudges – an analysis on the example of the EU health claims regime. Wageningen Working Papers in Law and Governance, 5: 1-33

Rayner M., Wood A., Lawrence M., Mhurchu C.N., Albert J., Barquera S., Friel S., Hawkes C., Kelly B., Kumanyika S., L'Abbé M., Lee A., Lobstein T., Ma J., Macmullan J., Mohan S., Monteiro C., Neal B., Sacks G., Sanders D., Snowdon W., Swinburn B., Vandevijvere S., Walker C. 2013. Monitoring the health-related labelling of foods and non-alcoholic beverages in retail settings. Obesity Reviews, 14: 70-81

Roberto C.A., Shivaram M., Martinez O., Boles C., Harris J.L., Brownell K.D. 2012. The Smart Choices front-of-package nutrition label. Influence on perceptions and intake of cereal. Appetite, 58, 2: 651-657

Roe B., Levy A.S., Derby B.M. 1999. The impact of health claims on consumer search and product evaluation outcomes: results from FDA experimental data. Journal of Public Policy & Marketing, 18, 1: 89-105

Rozin P. 2006. The integration of biological, social, cultural and psychological influences on food choice. V: The psychology of food choice. Shepherd R., Raats M. (eds.). Oxfordshire, CABI**:** 19-39

Sabbe S., Verbeke W., Deliza R., Matta V., Van Damme P. 2009. Effect of a health claim and personal characteristics on consumer acceptance of fruit juices with different concentrations of acai (*Euterpe oleracea* Mart.). Appetite, 53, 1: 84-92

Sanlier N., Seren Karakus S. 2010. Evaluation of food purchasing behaviour of consumers from supermarkets. British Food Journal, 112, 2: 140-150

Schermel A., Emrich T.E., Arcand J., Wong C.L., L'Abbe M R. 2013. Nutrition marketing on processed food packages in Canada: 2010 food label information program. Applied Physiology Nutrition, and Metabolism, 38, 6: 666-672

Schroeder J.E. 2002. Visual consumption. London/New York, Routledge: 186 str.

Signal L., Lanumata T., Robinson J.A., Tavila A., Wilton J., Mhurchu C.N. 2008. Perceptions of New Zealand nutrition labels by Maori, Pacific and low-income shoppers. Public Health Nutrition, 11, 7: 706-713

Sirieix L., Delanchy M., Remaud H., Zepeda L., Gurviez P. 2013. Consumers' perceptions of individual and combined sustainable food labels: a UK pilot investigation. International Journal of Consumer Studies, 37, 2: 143-151

Skubisz C. 2017. Naturally good: front-of-package claims as message cues. Appetite, 108: 506-511

Slokan P. 2016. Učinki različnih vizualnih podob na razumevanje prehranskih in zdravstvenih trditev na živilih. Magistrsko delo. Ljubljana, Biotehniška fakulteta, Oddelek za živilstvo: 108 str.

Sobal J., Bisogni C.A., Devine C.M., Jastran M. 2006. A conceptual model of the food choice process over the life course. V: The psychology of food choice. Shepherd R., Raats M. (eds.). Oxfordshire, CABI**:** 1-18

Solomon M.R. 2013. Consumers in the marketplace. V: Consumer behavior: buying, having, and being. Solomon M.R. (ed.). Essex, Pearson Education Limited**:** 26-65

Sonnenberg L., Gelsomin E., Levy D.E., Riis J., Barraclough S., Thorndike A.N. 2013. A traffic light food labeling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. Preventive Medicine, 57, 4: 253-257

Souiden N., Abdelaziz F.B., Fauconnier A. 2013. Nutrition labelling: employing consumer segmentation to enhance usefulness. Journal of Brand Management, 20, 4: 267-282

Sparke K., Menrad K. 2009. Cross-European and functional food-related consumer segmentation for new product development. Journal of Food Products Marketing, 15, 3: 213-230

Steenhuis I.H., Kroeze W., Vyth E.L., Valk S., Verbauwen R., Seidell J.C. 2010. The effects of using a nutrition logo on consumption and product evaluation of a sweet pastry. Appetite, 55, 3: 707-709

Storcksdieck genannt Bonsmann S., Celemin L.F., Larranaga A., Egger S., Wills J.M., Hodgkins C., Raats M.M. 2010. Penetration of nutrition information on food labels across the EU-27 plus Turkey. European Journal of Clinical Nutrition, 64, 12: 1379-1385

Storm D. 2007. An introduction to consumer behaviour. V: Consumer behaviour: a European perspective. Solomon M., Bamossy G., Askegaard S.,Hogg M.K. (eds.). Harlow, Financial Times/Prentice-Hall: 3-31

Stran K.A., Knol L.L. 2013. Determinants of food label use differ by sex. Journal of the Academy of Nutrition and Dietetics, 113, 5: 673-679

Svederberg E., Wendin K. 2011. Swedish consumers' cognitive approaches to nutrition claims and health claims. Food & Nutrition Research, 55: 1-9

Talati Z., Pettigrew S., Hughes C., Dixon H., Kelly B., Ball K., Miller C. 2016. The combined effect of front-of-pack nutrition labels and health claims on consumers' evaluation of food products. Food Quality and Preference, 53: 57-65

Talati Z., Pettigrew S., Neal B., Dixon H., Hughes C., Kelly B., Miller C. 2017. Consumers' responses to health claims in the context of other on-pack nutrition information: a systematic review. Nutrition Reviews, 75, 4: 260-273

Thomson R.K., McLean R.M., Ning S.X., Mainvil L.A. 2016. Tick front-of-pack label has a positive nutritional impact on foods sold in New Zealand. Public Health Nutrition, 19, 16: 2949-2958

Tuorila H., Cardello A.V. 2002. Consumer responses to an off-flavor in juice in the presence of specific health claims. Food Quality and Preference, 13, 7–8: 561-569

Turner M.M., Skubisz C., Pandya S.P., Silverman M., Austin L.L. 2014. Predicting visual attention to nutrition information on food products: the influence of motivation and ability. Journal of Health Communication, 19, 9: 1017-1029

Uredba (EU) št. 1169/2011 Evropskega parlamenta in Sveta z dne 25. oktobra 2011 o zagotavljanju informacij o živilih potrošnikom, spremembah uredb (ES) št. 1924/2006 in (ES) št. 1925/2006 Evropskega parlamenta in Sveta ter razveljavitvi Direktive Komisije 87/250/EGS, Direktive Sveta 90/496/EGS, Direktive Komisije 1999/10/ES, Direktive 2000/13/ES Evropskega parlamenta in Sveta, direktiv Komisije 2002/67/ES in 2008/5/ES in Uredbe Komisije (ES) št. 608/2004. 2011. Uradni list Evropske unije, L304: 18-63

Uredba (ES) št. 1924/2006 z dne 20. decembra 2006 o prehranskih in zdravstvenih trditvah na živilih. 2006. Uradni list Evropske unije 49, L404: 9-25

Van der Bend D., Van Dieren J., De Vasconcelos M., Wezenbeek N.L.W., Kostareli N., Guerreiro Rodrigues P., Temme E.H.M., Westenbrink S., Verhagen H. 2014. A simple visual model to compare existing front-of-pack nutrient profiling schemes. European Journal of Nutrition & Food Safety, 4, 4: 429-534

Van der Merwe D., Bosman M., Ellis S. 2014. Consumers' opinions and use of food labels: results from an urban − rural hybrid area in South Africa. Food Research International, 63, Part A: 100-107

Van Herpen E., Hieke S., Van Trijp H.C.M. 2014. Inferring product healthfulness from nutrition labelling. The influence of reference points. Appetite, 72: 138-149

Van Herpen E., Seiss E., Van Trijp H.C.M. 2012. The role of familiarity in front-of-pack label evaluation and use: a comparison between the United Kingdom and the Netherlands. Food Quality and Preference, 26, 1: 22-34

Van Herpen E., Van Trijp H.C.M. 2011. Front-of-pack nutrition labels. Their effect on attention and choices when consumers have varying goals and time constraints. Appetite, 57, 1: 148-160

Van Trijp H.C.M., Van der Lans I.A. 2007. Consumer perceptions of nutrition and health claims. Appetite, 48, 3: 305-324

Verain M.C.D., Sijtsema S.J., Antonides G. 2016. Consumer segmentation based on food-category attribute importance: the relation with healthiness and sustainability perceptions. Food Quality and Preference, 48, Part A: 99-106

Verbeke W. 2005. Agriculture and the food industry in the information age. European Review of Agricultural Economics, 32, 3: 347-368

Verbeke W. 2006. Functional foods: consumer willingness to compromise on taste for health? Food Quality and Preference, 17, 1–2: 126-131

Verbeke W. 2010. Consumer reactions to foods with nutrition and health claims. Agro Food Industry Hi-Tech, 21, 6: 5-8

Verbeke W., Scholderer J., Lahteenmaki L. 2009. Consumer appeal of nutrition and health claims in three existing product concepts. Appetite, 52, 3: 684-692

Visschers V.H.M., Hess R., Siegrist M. 2010. Health motivation and product design determine consumers' visual attention to nutrition information on food products. Public Health Nutrition, 13, 7: 1099-1106

Vlontzos G., Duquenne M.N. 2014. Assess the impact of subjective norms of consumers' behaviour in the Greek olive oil market. Journal of Retailing and Consumer Services, 21, 2: 148-157

Vyth E.L., Steenhuis I.H., Mallant S.F., Mol Z.L., Brug J., Temminghoff M., Feunekes G.I., Jansen L., Verhagen H., Seidell J.C. 2009. A front-of-pack nutrition logo: a quantitative and qualitative process evaluation in the Netherlands. Journal of Health Communication, 14, 7: 631-645

Vyth E.L., Steenhuis I.H., Vlot J.A., Wulp A., Hogenes M.G., Looije D.H., Brug J., Seidell J.C. 2010. Actual use of a front-of-pack nutrition logo in the supermarket: consumers' motives in food choice. Public Health Nutrition, 13, 11: 1882-1889

Wasowicz G., Stysko-Kunkowska M., Grunert K.G. 2015. The meaning of colours in nutrition labelling in the context of expert and consumer criteria of evaluating food product healthfulness. Journal of Health Psychology, 20, 6: 907-920

WHO. 2014. Global status report on noncommunicable diseases 2014. Geneva, World Health Organization**:** 280 str. http://apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf?ua=1 (maj, 2016)

Williams P., Yeatman H., Ridges L., Houston A., Rafferty J., Ridges A., Roesler L., Sobierajski M., Spratt B. 2006. Nutrition function, health and related claims on packaged Australian food products - prevalence and compliance with regulations. Asia Pacific Journal of Clinical Nutrition, 15, 1: 10-20

Zajonc R.B. 1968. Attitudinal effects of mere exposure. Journal of Personality and Social Psychology, 9, 2: 1-27

Žeželj I., Milošević J., Stojanović Ž., Ognjanov G. 2012. The motivational and informational basis of attitudes toward foods with health claims. Appetite, 59, 3: 960-967

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