Critical Review:
The efficacy of ultra-high frequency bone conduction stimulation for the treatment of tinnitus

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his critic re ie e ined the iter t ıre re ting to the effic cy of ı tr high freq ıency one cond ıction sti ı tion for the tre t ent of tinnit ıs he st ıdy designs re ie ed inc ıded fi e sing e gro ıp st ıdies ith pre posttest e peri ent design one of hich so inc ıded sing e s ı ect c se st ıdy one nonr ndo ized c inic tri cohort st ıdy nd t o prospecti e crosso er e peri ent st ıdies ith sing e s ı ect design O er the e idence did not s ıpport the ıse of one cond ıcted ı tr high freq ıency tre t ent for tinnit ıs nd ch ng in c ırrent c inic pr ctice is not reco ended Gi en the i ited n ı er of e designed st ıdies pro iding high e e of e idence f ırther rese rch sho ı d e co p eted F ıt ıre st ıdies sho ı d inc ıde p tients ith rio ıs types of tinnit ıs nd ıse rger s p e sizes prospecti e ithin gro ıp crosso er designs do ı e inding nd p ce os t o ıd so e enefici to co p re tre t ent res ı ts for sti ı i of different freq ıency r nges nd to co p re sti ı i de i ered i one cond ıction to sti ı i de i ered i ir cond ıction to deter ine hether one cond ıcted sti ı i is in f ct ore enefici th n tr dition tinnit ıs s ing ethods

Introduction

innit ıs is pro e f ced y o er i ion peop e in the nited St tes nd se ere c ses h e een reported y ppro i te y i ion nt ı nd Sper ing → p → innit ıs is sy pto ch r cterized y sens tions in the he d or e rs in the sence of e tern sti ı i nd y inc ıde ringing ı zzing or other noises innit ıs Associ tion of C n d So e s ıfferers report irrit tion diffic ı ty ´concentr ting diffic ı ty s eeping depression nd fee ings of desp ir Er ndsson p Gi en the pre ence nd effects of tinnit ıs it is i port nt to e ı te tre t ent options to deter ine hether there is e idence to s ıpport the i p e ent tion of ne ther pies in c inic pr ctice

here re t o in c tegories of tinnit ıs o ecti e nd s ı ecti e O ecti e tinnit ıs is physic so ınd th t origin tes intern y nd c n e detected y physici n n contr st s ı ecti e tinnit ıs is ıdi e on y to the p tient s ıffering fro the disorder nt ı nd Sper ing → p → nd A piner nd McC rthy p his is the type th t is ıs ı y eing referenced hen the ter tinnit ıs is ısed

here re se er tre t ent options i e to tinnit ıs p tients s ıch s innit ıs Retr ining her py R s ing p ific tion nd i iting tinnit ıs ind ıcing gents nd en iron ent f ctors R in o es h it ı ting the p tient s re ctions to tinnit ıs r ther th n tte pting to e i in te the so ınds Loc ood S i nd B ır rd R in o es co ınse ing nd ed ıc ting p tients nd ısing so ınd ther py e g so ınd gener tors or he ring ids to enh nce e tern so ınds stre off nd H ze p nd innit ıs Associ tion of C n d

innit ıs s ing is nother for of tre t ent th t´s ıppresses tinnit ıs y ısing e tern so ınd to red ıce tinnit ıs perception stre off nd H ze p nd ohnson → p → De ices ısed to prod ıce tinnit ıs s ing effects fit ehind or in the e r nd re ıs ı y orn y nor he ring tinnit ıs p tients For so e p tients it prod ıces resid ı inhi ition or period of tinnit ıs re ief th t is e perienced fter s ing h s een re o ed ohnson → p → → hi e s ing is co on ethod of tre t ent not p tients e perience i pro e ent Loc ood S i nd B ır rd Gi en th t signific nt n ı er of indi id ı s ith tinnit ıs h e he ring oss p ific tion c n so e ısed s tre t ent So e st ıdies h e reported tinnit ıs re ief in of p tients ho ısed he ring ids tho ıgh the re son for this is ın no n nt ı nd Sper ing → nd stre off nd H ze Other tre t ents in o e i iting f ctors th t contri ıte to tinnit ıs inc ıding e pos ıre to o ıd noise nd ısing s ing techniq ıes s ıch s soft hite noise t night to pro ote s eep nt ı nd Sper ing → P tients y so e instr ıcted to discontin ıe the ıse of tinnit ıs ind ıcing dr ıgs nd to n ge et o ic or diet ry disorders hich y in o e the oid nce of nicotine choco te coffee or te nt ı nd Sper ing → he n ge ent of cti e e r conditions c n so i pro e tinnit ıs nd y e s si p e s ısing topic nti iotics to tre t otitis e tern nt ı nd Sper ing → nd S nder →

Objective

he pri ry o ecti e of this p per is to critic y e ı te the effic cy of ı tr high freq ıency one

Methods

Search Strategy Co pɹterized d t ses inc ɹding MEDL NE SCOP S C NAHL nd P ɹ Med ere se rched ɹsing the fo o ing se rch str tegy high ɹdio freq ɹency OR ɹ tr sonic OR ɹ tr high freq ɹency OR high freq ɹency one cond ɹction OR tr Q ɹiet AND tinnit ɹs he se rch s i ited to Eng ish nd H ɹ ns s ɹ in r

Selection Criteria St ɹdies inc ɹded in this re ie e ined the ɹse of ɹ tr high freq ɹency sti ɹ i i e sti ɹ i th t inc ɹded freq ɹencies o e Hz de i ered i one cond ɹction for the tre t ent of tinnit ɹs Re ie rtic es ere not inc ɹded niti st ɹdies ere se ected y re ie ing str cts to deter ine hich rtic es et the inc ɹsion criteri he reference ists in the rtic es se ected ere so e ined

Data Collection he res ɹ ts of the iter t ɹre se rch yie ded eight rtic es for inc ɹsion in the re ie fi e sing e gro ɹp st ɹdies ith pre posttest e peri ent design one of hich so inc ɹded sing e s ɹ ect c se st ɹdy one nonr ndo ized c inic tri cohort st ɹdy nd t o prospecti e crosso er e peri ent st ɹdies ith ithin gro ɹps repe ted e s ɹres design

Results

Study #1. Go dstein Sh ɹ n Lenh rdt Rich rds M dsen nd G ɹint e ɹ ted the resid ɹ inhi ition of tinnit ɹs fo o ing tre t ent ith the de ice in p tients ith i d to oder te high freq ɹency he ring oss nd se ere dis ing high pitched tinnit ɹs he st ɹdy ɹsed sing e gro ɹp n pre posttest e peri ent design

he tre t ent consisted of digit y processed ɹsic th t s ɹsed to od ɹ te Hz sign de i ered i one cond ɹction tr nsd ɹcer to the stoid he sti ɹ ɹs s presented t dB o e e ch s ɹ ect s thresho d he s ɹ ects istened to the sti ɹ ɹs for in ɹtes incre sing to in ɹtes d y t ice ee for fo ɹr ee s A ɹdiogr s nd tinnit ɹs pitch tching proced ɹres ere perfor ed pre nd post tre t ent nd q ɹestionn ire s d inistered onths fter the end of tre t ent B sed on the res ɹ ts of the q ɹestionn ires s ɹ ects reported i pro e ent in their tinnit ɹs nd the d ɹr tion of the i pro e ent ried fro s ɹ ect to s ɹ ect sting fro ho ɹr to ee s o s ɹ ects reported no resid ɹ inhi ition of the tinnit ɹs here ere no signific nt ch nges in the p tients ɹdiogr s fo o ing tre t ent

his st ɹdy did not inc ɹde r ndo iz tion or contro s nd st tistic n yses ere not reported he res ɹ ts sho ɹ d therefore e interpreted ith c ɹtion

Study #2. Lenh rdt Go dstein Sh ɹ n nd G ɹint e ined the effecti eness of the de ice for tinnit ɹs tre t ent in rese rch report th t hree inc ɹded different st ɹdies e s ɹ

s ing tinnit ɹs nd od ɹ ting its o ɹdness hen st nd rd i r tors ere ɹsed Ho e er the gnetostriction tr nsd ɹcer s ineffecti e s it ec e ɹnco fort y r d ɹring tre t ent

he st ɹdy did not ɹse r ndo iz tion or contro s nor did it pro ide s ɹfficient infor tion o ɹt the e s ɹres ɹsed to e ɹ te tre t ent o ɹtco es St tistic n yses ere not reported nd the s p e sizes for e ch e peri ent in this st ɹdy ere s

Study #3. Sh ɹ n Str sh ɹn A it e Lenh rdt nd Go dstein ɹsed positron e ission to ogr phy PE s n o ecti e onitoring syste to co p re r in et o is efore nd fter the ɹse of ɹ tr high freq ɹency tinnit ɹs ther py hey so co p red the PE d t ith s ɹ ecti e eh io ɹr responses of the s ɹ ects he st ɹdy ɹsed sing e gro ɹp pre posttest e peri ent design n A p tients e perienced s ɹ ecti e idiop thic tinnit ɹs nd ere r ndo y se ected fro p tients ho ere recei ing ther py he e peri ent gro ɹp n recei ed tre t ents ith the ther py de ice for period of ee s A p tients ere e ɹ ted ccording to edic ɹdio ogic tinnit ɹs protoco hich inc ɹdes ɹ tr high freq ɹency nd con ention ɹdio etry se f d inistered tinnit ɹs q ɹestionn ires tinnit ɹs pitch nd o ɹdness tching nd ini s ing e e e s ɹres PE s co p eted ee prior to tre t ent nd ithin ho ɹrs of the fin tre t ent PE sc ns ere n yzed for t e e regions of interest RO the eft nd right th ɹs the te por ɹditory p riet nd front o es nd the cere e ɹ he Bonferroni correction for p ired t tests s ɹsed nd it s reported th t nor ized d t for interhe ispheric differences in the cere e ɹ eft ers ɹs right ere signific nt p efore tre t ent ɹt ere not signific nt p fo o ing tre t ent Ho e er sed on the signific nce e e ɹsed p it ppe rs th t the pre nd post tre t ent interhe ispheric differences in the cere e ɹ ere not signific nt here ere no signific nt differences fo ɹnd efore or fter ther py in other RO S ɹ ects reported rying degrees of tinnit ɹs i pro e ent on the q ɹestionn ires nd ini s ing e e s ere fo ɹnd to e signific nt y red ɹced he est s ɹ ecti e reports ere fro p tients ith thresho ds of dB or ess fro Hz he ɹthors conc ɹded th t the corre tion ong PE nd ch nges in ini s ing e e s ɹ tr high freq ɹency ɹdiogr s nd the s ɹ ecti e reports s ɹggest th t tre t ent ind ɹced ne ɹron

recei ed the s e tre t ent ith on y s
differences in the tre t ent periods nd no contro s
ere ɹsed n ddition the st ɹdy did not pro ide
s ɹfficient infor tion o ɹt the e s ɹres ɹsed to
e ɹ te tre t ent o ɹtco es

Study #5. Go dstein Sh ɹ n nd Lenh rdt presented the res ɹ ts of their p tient se ection criteri for predicting s ɹccess in p tients recei ing ɹ tr high freq ɹency ther py ith the de ice or ɹ tr sonic co ɹstic ther py ith the *on c* de ice