



&\WRNLQH DQG /LSLG 0HGLDWRU 5HJXODWLRQ ,/& V LQ +XPDQ \$LOUZHUV 'LVHDXH

.HOHQ &DYDJQHUR DQG 7D\ORU \$ 'RKHUW\ 'HSDUWPHQW RI 0HGLFLQH 8QLYHUVLW\ RI &DOLIRUQLD 6DQ 'LHJR 86\$ &RUUHVSROGLQD\WRKHUW\ 'HSDUWPHQW RI 0HGLFLQH 8QLYHUVLW\ RI &DOLIRUQLD 6DQ 'LHJR % /D -ROOD &\$ 86\$ 7HO)D[WGRKHUW\#KXPDCGX 5HFHLYHG-&DWH \$FFHSWHG-&DWH 3XEOLVKHG-&DWH &RSULJKW &DYDJQHUR . HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WH XQUHVWULFWHG XVH GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO D

\$EVWUDFW 7KHUHFHQW GLVFRYHU\ RI JURXS LQQDWH O\PSKRLG FHOOV ,/& V KDV FDXVHG RI DOOHUJLF DLUZD\ GLVHDXH SDWKRJHQHVLV 3ULRU WR WKH GLVFRYHU\ RI ,/& SULPDU\ VRXUFH RI W\SH F\WRNLQH KRZYHU DFWLYDWHG ,/& V KDYH VLQFH E LQ VRPH FDXHV GRPLQDQWO\ WR W\SH F\WRNLQH SURGXFWLRQ 6LQFH WKH GLV KDYH EHHQ VKRZQ WR UHJXODWH WKHLU HIIHFWRU IXQFWLRQV ,QLWDO VWXGLHV ,/ DQG 76/3 DV DFWLYDWRUV RI ,/& V DQG UHFHQW VWXGLHV KDYH LGHQWLI PHGLDWRUV WKDW DUH LQYROYHG LQ ,/& UHJXODWLRQ ,/& V DQG WKHLU PHGLD DOOHUJLF DLUZD\ GLVHDXHV DQG LQWHQVLYH LQYHVWLJDWLRQ LV XQGHUZR\ WR DQG GRZQVWUHD\ SDWKZD\ WKDW OHDG WR ,/& GULYHQ DLUZD\ SDWKRORJ\ ,Q DQG OLSLG PHGLDWRUV WKDW UHJXODWH ,/& V LQ KXPDU DOOHUJLF DLUZD\ GLV PHGLDWRUV RI PRXVH ,/& V WKDW PD\ HYHQWXDOO\ WUDQVODWH WR KXPDUV

.H\ZRUG\VRXS LQQDWH O\PSKRLG FHOOV SURGXFWLRQ ZKHUHQH\WLPXODWLRQ Z /HXNRWULHQHV \$VWKPDU 5KLQLWLW ,/0HJXODWLRQ 8HJXODWLRQ \$SURVWUDFODQ DLUZD\ GLVHDXH \$VSLULQ ([DFHUEDWHG UHVSROGLQD\WRKHUW\ @VHXWKHU FRPELQ XWLOL]H QRQ UHGXQGDQW VLJQDOLQJ SDV ,QWURGXFWRQ HYHQ V\QHUJLVWLF DFWLYDWRU > @

*URXS LQQDWH O\PSKRLG FHOOV ,/& V DUH D UHODWLYHO\ QHZO\ GLVFRYHUHG O\PSKRFLWH SRSXODWLRQ WKDW SURPRWHV IHDWXUHV RI DOOHUJLF DLUZD\ GLVHDXHV LQFOXGLQJ DVWKPDU DQG FKURQLF UKLQRVLQXVLWLW WKURXJK VHFUHWLRQ RI WKH W\SH F\WRNLQH ,/ ,/ DQG ,/ DPRQJ RWKHUV 8QOLNHFHOOV ,/& V ODFN 7 FHOV UHFHSWRUV DQG WKUHIRUH DUH QRW FRWUROO\GHWHQVHG. > @ \$GGLWLRQDOO\ ,/& V ODFN XUIDFH UHFHSWRUV H\SUHVHG E\ WKH PDMRU KHPDWRSLHWLF O\PSKRFLWH OLQHDJHV LQFOXGLQJ % 7 QDWXUDO NLOOHU 7 1.7 DQG QDWXUDO NLOOHU 1. FHOOV > @ ,Q PRXVH PRGHV RI DVWKPDU ,/& V KDYH EHHQ VKRZQ WR GULYH DLUZD\ HRVLQRSKLOLD K\SHUHVSRQVLYHQHV DQG PXFRXV K\SHU VHFUHWLRQ WKDW DUH DOO IHDWXUHV RI DOOHUJLF DVWKPDU > @ 5HFHQW LQFUHDVHG OHYHOV RI ,/& V KDYH EHHQ GHWHFWHG LQ SDWLHQWV ZLWK DOOHU DLUZD\ GLVHDXHV LQFOXGLQJ DVWKPDU DOOHUJLF UKLQLWLW \$5 DQG FKURQLF UKLQRVLQXVLWLW &56 > @)XWKHU ,/& V DUH UHFUXLWHG WR QDVDO PXFRVD IURP WKH EORRG LQ DVSLULQ H[DFHUEDWHG UHVSUDWRU\ GLVHDXH \$(5' ZKLFK LV FKDUDFWHUL]HG E\ LQWHQVLYH HRVLQRSKLOLD QDVDO SRO\SV DVWKPDU DQG UHVWULQKHBEWLRQ > @

6WXGLHV H[DPLQLQJ WKH UHJXODWLRQ PRYHG & RPRVWDLV DFWLYDWRU DQG SUROLIHUHQV\RIHQV\RI PHGLDWRUV WR DUH LWDOLF\HG DQ SURPRWH DQG LQKLELW WKHLU IXQFWLRQ (DUO\ ,/& VWXGLHV XVLO\ PRXVH PRGHV RI DVWKPDU ZLWK SURWHDVH GHULYHG DOOHUJHQV GHPRQVWUDWHG WKL GDPDJHG DLUZD\ HSLWKHOLD FHOOV UHODWLYH WR W\SH F\WRNLQH ,/& V SC DFFHVV MRXUQDO SRWHQWO\ DFWLYDWH ,/& V OHDGLQJ WR SURSO\G % RHO :/ FODVV VLQV KLQ ,/ > @ ,QWHUHVWLQJO\ FHUWDLQ ,/& GULYH DLUZD\ WR UHFRSOD\ RI VW LQGXFLOJ VHOHFW W\SH F\WRNLQH SURGXFWLRQ UHFRSOD\ VLQ DQ D\WRF RI ,/& V ZLWK ,/ UHVXOWV LQ ,/ DQG DLUZD\ K\SHUHVSRQVLYHQHV JREOHW

VHFUHWLRQ DQG ,J(FLOWUHY VHZZ VZELQOQ D BU MJO L PIRCFW LIR/Q > DSSHDUV WR VHUYH D
RQ WKH XSVWUHP F\WRNLQH DQG OLSWLB /FHGLEB VSRUWV PVIQDWD QHPRXQDHWPR QH OW LQ
KXPDQ DOOHUJLF DLUZD\ GLVHVDH ZKLPIS RUCWDVMPHFDHVVHGH RQQMLW XDMH SBDN H
DGGLWLRQ ZH ZLOO KLJKOLJKW QHZO\ WKLVIH KBNIGVPSBLVDWROOVHRIJ RQ XFKD, OQVQ,
WKDW PD\ DOVR WUDQVODWH WR KXPDQOHVVHU PDJLWXGH WKDQ ,/ WZHOYH
(SLWKHOLDO &\WRNLQH V WKDW 5HJXODWLRQ &WKRXJK UHOHYDQFHVWR K
EHFDXVH ,/ 'LQGXFHG DFWLYDWLRQ RI ,/
DVWKP DQG &56Z13 SDWKRJHQHVLV ,/
WKHUDSHXWLF WDUJHW

,/ KDV EHHQ VKRZQ WR EH D SRWHQW GULYHU RI H[SHULPHQWDO DOOHUJLF
DLUZD\ GLVHVDH LQ PLFH DQG LWV HTSHUHQV WR QR PDQ O H HPS R RSRN RGHWR L Q D Q 7 6 /
KXPDQ DOOHUJLF DLUZD\ GLVHVDHV > @ ,Q KXPDQV ,/ H[SHUHVLRQ LV
KLJKO\ XSUHJXODWHG LQ \$(5' SDWLHQW ODFWU SROO & SSK SBLHWLWQ Q 76/3 LV
VHFUHWLRQV DQG DVWKP DFWLYDWLRQ ZDV GHYLVHVVHGHVWUHQFHWKHSWLFYHOV L
GHPRQVWUDWLQJ WKH KLJKHVW H[SHUHVLRQ ZHUH GLVFRXUJHGLVLC@O76/3 H[SHU
H[SHUHVLRQ LV QRW XSUHJXODWHG LQ SRO\ SRO\ SRP & R R D Q G W K F ' , S D W L H Q W S W R \$ 5
KDV EHHQ GHWHFWHG DW KLJKHU OHYHOV WKP D W L F D L U Z D \ Q H S A W K H O U R O S R H Q O V W
JHQRP H ZLGH DVVRFLDWLRQ VWXGLHV GLYHID WKRZHQ WKDW VPDOO @ XFOH WLRQ
SRO\ PRUSKLVV 613V LQYROYLQJ ,/ DQG H D V H G H F H S W R F W B U H W D V H F D W R E L D V
ZLWK LQFUHDVHG DVWKP DVVFWHSWLELOLWYWKBD @ @

,/ LV FODVVLFDQO\ FRQVLGHUH G D Q L S L D Q H O 7 6 3 Z H V L Y H Z Q F W R U S I V S R H V &
KRZHYHU HQGRWKHOLDO FHOOV VPRR W R G P W K L Y H U R P O H Z D V W K P X H U S K R J H V S U L
H[SHUHV ,/ > @ ,/ DQG ,/ Z K L S K L D P D W L L S L Q W R H O L 3 O > F @ O O Q D G G L W
GHULYHG } Z H V W H W W K L H Q H V G H P R Q V W U D W H 7 6 3 W R U H F W L Q W X P D Q U V W H G I ' V K R Z H G W K
,/& V > @ ,Q PLFH ,/ DGPLQLVWUDWLRQ O L D O O H H W H O U R H X D V R S H S R W H Q W
LPPXQH UHVSQVH LQGSHHQGHQW RI D D S W L Y H L G G L Q V E D W S K L Q V Z D Q G R Q H V
RI W K L W F O X H V W R W K H S U H V H Q F H R I D Q R X H O H R B I 7 7 6 3 O O @ S U R G X K X P D Q V 7 6 / 3 H
F\WRNLQH V H > ,/ @ UHFHSWRU LV D KHWHURGLPHULF UHFHSWRU Q R V R D M R P H R V W D W L F
FRPSRVHG RI 67 DQG ,/ 5 7 6 7 > @ H V S S T W L Y H O D O F H O O S R V S H V H W D O V K
LQFOXGLQJ FHOOV HRVLQRSKLOV GHQGU S W H H Q W O D F W L Y D W H F W S K D J P V X Q H U V
EDVRSKLOV PDVW FHOOV DQG 1.7 FHOOV D O V R D O V R @ I S T H V H F W M E W O G L Q G V R H W K H
DFWLYDWHG E\ ,/ > @ ,Q D ODQGP D N D K H W H U R G L W X G F U H F H S W R U Z K L F K
SHULSKHUDO EORRG DQG IHWDO JXW Z H U H F W R Z Q > W R @ S U R G X F H ,/ L Q
UHVSQVH WR ,/ L Q W L W X R O D W R B O D Q W O \$ V W K H D U W K R W V N Q R Z Q U R O H L Q D G D S W
ZHUH} U W K M R L G H Q W L I ,/& V L Q K X P D Q O X R X G L W R X E H @ S R W H O D O F W K Y H W R U R I ,/ &
> Q G L Q X W J H V W W K D W W K H G L V H D V H G K O B @ S P L U Z W X G D O M K Y E L U R Q A W Q M O V K R
ZKHUH ,/ DQG RU LWV UHFHSWRU D U R F F W L D Y H G D O E O R Z G W K Q X F R W D O S R O
,/& VXV ,/ LQGXFHG DFWLYDWLRQ RI ,/& V W H U W O D N H V U S W L R Q D O R O H J X O D W R U
LQ KXPDQ DOOHUJLF DLUZD\ GLVHVDH S P W K R J H Q H V L V H O H R W 7 6 / 3 G U L Y H Q D F W L Y D
,/ Z D V H Q K D Q F H G E I D G G L W L R Q R I ,/ , Q W H
HW DO IRXQG WKDW RI WKH HSLWKHOLDO

6LPLODU WR ,/ WKH HSLWKHOLDO DEOH WR LQGXFH ,/& FRUWV L E B W W R I N Q R Z Q
SURPRWH H[SHULPHQWDO DOOHUJLF E H S U H V H Q W H D V P R X Y H E H & Y O G L W @ , F
H[SHUHVLRQ KDV EHHQ OLQNHG WR KXPDQ DLUZD\ GLVHVDH DOZR VLJH O R D O X K R Z O L U
HW DO IRXQG WKDW KXPDQ DVWKP DFWLYDWLRQ F E V L R S K L O V D Q G R K V S H U H U R S R Q R O H O I D Q
FKDOOHQJHG ZLWK DOOHUJHQ KDG LQFUHDVHG Q X P E H V R I J 7 W K D O G W K H V H U H V X
FHOOV DQG /HH HW DO IRXQG LQFUHDVHG L Q G X F H U R I H S G O F E R D W L S H Q Q D V D G D
QDVDO SRO\ S W L V V X H > @ 7 R R X U N O R Z O H G H Y L O R K X V P D Q V L O & 5 6 S D W L H Q W 7 6 / 3
FRUHWODWLRQ EHWZHHQ ,/ DQG RU L W V D O O H U J L F D U X G L H V W K H U H I R X G G 7 6 / 3
SDWLHQW WLVVXH

\$GGLWLRQDO &\WRNLQH 5HJXODWLRQ
Q R S H Q D F F H V V M R X U Q D O ,/ LV FODVVLFDQO\ FRQVLGHUH G WR EH DQ HSLWKHOLDO
F\WRNLQH KRZHYHU HQGRWKHOLDO D O O R D W R V L Q R S K L O V
FHOOV KDYH DOVR EHHQ VKRZQ WR VHFUHW ,/ > @ ,/ ELQGV WR WKH
,/ 5 UHFHSWRUaD KHWHURGLPHULF UHFHSWRU H O R P H O W L R U , R & V I U S P F R Q P R Q C
,/ 5%aZKLFK LV H[SHUHVHG RQ W K H O M T U I D F H V R / 5 & D Q G ,/ 5 H[SHUHVLRQ DQG
HRVLQRSKLOV ' & V P D F U R S K H J H L W L Q G O D X T R E K C F W E R @ D O ,/& V > @ ,/ LV D
,/& VWXG\ WKDW VKRZHG WKDW ,/ S F U R G X F H E V E I / & S L W P H V L D R X Q E O W K D W G ' & V
,/& V LQ SHULSKHUDO EORRG DQG IHWDO S O R P X W S U R G X F H V W D V L Q D U H S R Q V L I W R D W

PHWKDFKROLDVHFKD D G P I Q Q HVWUDWLRQ DZKLRH H O Q R D W K H G L W X D G W K P D W L F D L U Z D \ V
VDZ D GHFUHDVH LQ) (9 > @ > @

3* , LV KLJKO\ H [SUHVHVG LQ OXQJ WLQXH D J Q U H S U W G X I D P G C E L Q V P R & W K D Q G K
PXVFOH FHOOV H E O R R E V O B O M B O O F H O G M C O R G L W L H F H F O S H W L B K G U D O E O R R G , / & Q X P
WK\PLF QXUVH FHOOV > @ Q W L L Q D D F S D W E R U D W L F W H O P L O G D V W K P D W L F V D Q G K
SURSHUWLHV B Q G F W M H B X W K L V L Q G L Q J R M X E K H T S U R Q W D F H S G L O W V U K L O F H M / K R Z Q E H U V
UHFHSWRU ,3 ZKLFK LV H [SUHVHVG E D P W Q Y D W P R Q H E H W O Z H W Q S H W W L K P F O W K L F L Q D Q G
ERQH PDUURZ GHUHFHOG F H O O V D Q G , / & W W D O 3 R X Q G L Q F U H D V H G Q X P E H U V R I S
,3 LQWHUDWLRQV XOWLPDWHO\ UHVXOWWRN L V R R W K V S R O F M W O D O D M U R Q F U H G W
FHOOXODU SURDQWLUDQV D P P D P O G L V P V L Q F Q G G O V V X S S R U W H G E I D V W X G \
LQFUHDVHG VHFUHWLRQ RI , / E I 7 U H J Q X P E U V R I D F W L Y D W H G , / & V L Q W K H E

, Q =KRX HW D W R Z D H S R K W W K D W 3 @ L Q K L W K H U Y P R H L Q F U H D V H G Q X P E H U V
IXQFWLRQ > @ , Q W K L V V W X G \ E R Q H > P D U U R Z D G F U S H G G G L F D V W K P D S D W L H Q
ZLWK , L Q Y L W D G R U H G X F H G , / D Q G , / U H F H D W X F W L S G L H V D Q D Y H D O V R G H P R Q W U I
S U R O L I H U D W L R Q L Q W K H S U H V H Q F H V R I U H F H D W X F W L S G L H V D Q D Y H D O V R G H P R Q W U I
D W W H Q X D W L R Q Z D V S U H Y H Q W H G L Q , / D O O H U D E N L Q F K D O O H Q ' J H L Q D Y W K P D W L F V
\$ O W H L F K D D I O C H Q J H G , 3 N Q R F N R X W P L F H I H K L E L W H G X P B W K O V L F E B D Y H G
Q X P E H U V R I O X Q J , / & V D Q G L Q F U H D V H G G I & V L O G Q D Q S U R G X F W L R Q D L Q V W R E
FRPSDUHG WR ZLOG WISH PLFH) X U W K L P P E R Q Y I G L W K S D P X G W L W Y H B E I D Q L P D
& L F D S U R V W D I O G G U O E Z H U O H Y H O V R I , / & V D Q G W I S H F W R N L Q H
S U R G X F W L R Q F R P S D U H \$ O W W B O O R L E P J L L Q D O O
& L F D S U R V W Z D V I R X Q G W R L Q K L E L W , \$ O O H U L F U K L Q L W L V Q S H U L S K H U D O
E O R R G , / & , / D Q G , / H V B O G G W L R Q W \$ K D W J L F U K L Q L W L V L V F D X V H G E I D Q
3* , P L J K W L Q K L E L W , / & G U L Q H D P D O O I R Q D P D W L S R Q V H W R L Q K D O H G D O O H U J H
K X P D Q V V I P S W R P V L Q F O X G L Q J G O H F B O W D W W E Q
G L V F K D U J H > @ 3 U H Y L R X V Z R U N G H P R

6SHFLDOLJHG 3UR 5HVROYLQJ /LSLGLWHLGLD WRS D W L H Q W V Z L W K D O O H U J H
/LSR[LQ \$ /;\$ LV JHQUHDWHG E I W D F W L Y D W L R Q J H Q U H D W L R Q D O G F K H P
SDWKZD\ LQ HRVLQRSKLOV HSLWKHOLD U F H O V Q D Q G S P D W K R S K O H V V 3 D W L H Q W
VHYHUH DVWKPD KDYH UHGXFHG OYHUV P U S U H V V R Q D S B Y L R X Q G W R E H L Q F U H D V H G
)35 \$ V W X G \ I R X Q G W K D W S D W L H Q W Z W K \$ 5 F R Q S D U R G O R Z L O F R Q W R O S D W L H Q W
FKDOOHQJH H [KLELWHG D UHGXFWRQ R I D V W K P D W L F D L U Z D \ U H V S R Q V H V
V X J J H V W L Q J D S U R W H F W L Y H U R O H R I ; ; S I U W W X O K W B H I D P I Q H 5 W K H Q W H O D W L R Q
% D U Q L J H W D O I R X Q G W K D W K X P D Q S I R X O G M K D W E O R R G F B W D O S H U H V H Q W K D O C
/ ; \$ U H F H S W R U D Q G W K D W / ; \$ L Q K L E L W H G L E D O H G O R D H G H S H U G H W H J H R I , / &
S U H V H Q F H R I , / L Q Y L W D G R 3 * ' F R P S D U H G W R F R Q W U R O F K D O O H G L H D @

0DUHV LQ LV D SURGXFW RI RPHJD V X E V H T X H Q W U H S R U W I R X Q G W K D W S H U L S I
UHSRUW LQYH V H F W D P D H U G W L Q H D Q G , / & F R P S D U H G W R > F O W U R O S D W L H Q W D Q G
8VLQJ D PHWDEROLSLGRPLFV DSSURDFK V X E L X W D G H P R X V F P P X O R W K H U D Q G > @ I R Z
PDUHV LQ LV LQFUHDVHG LQ PRXVH O X Q J W L V X H G X T L O W K H U H P O X W L R Q
SKDVH RI L O C O I P D W L R Q V L Q D G L Q L X L W D W L R Q L Q F U H D V H G O H Y H O V R I , / & V L Q W K H S H U I
LQKLELWHG , / & D F W L Y D W L R Q D Q G S U R P R W H G G W K H J H Q U H D W L R Q V X E
UHVXOWLQJ LQ W I Q H D U P P D P O R R Q D O L Q F O X G L Q J D P I G W R O L O K H W H X O W D V V X E
QHfhvvdU\ WR GHWHUPLQH WKH UROH I R X Q G W L R Q D W L R Q U H V S R Q V W K R U @ V K I
UHVSRQVHV W K D W S H U L S K H U D O E O R R G , / & V Z H U H L Q F
V W D W X V L Q S D W L H Q W V Z L W K + ' 0 \$ 5 F R P

/ & 5HJXODWLRQ LQ +XPDQ \$LUZD\ VHDVHF SODWHHERRHOG WEH W K H W H R Q V
RSHQ DFFHVV MRXUQDO P H F K D Q L P V R I D F W L R Q D Q G R U O H Y H O
\$VWKPD W R J H W K H G L O G H P R V W U D W H W K D W S H & L Y F P
\$VWKPD LV D FKURQLF OXQJ GLVH D R H F K D U F W H U L W H G V E I (B U L Z D) Q D V D O
LQ-DPPDVLVDFUHDVHG PXFRXV SURGXFWLRQ KISHUHVSRQVLYHQHV DQ G
UHPRGHOLQJ DORQJ ZLWK VPSWRPV W K D W L Q F O X G H G V S Q H D Z K H H J L Q J
FKHVW WLJKWQHVV DQ G FRXJKLQJ > @ S O W K R X J K W K H U H D U H P D Q \ V X E W I S H V
RI DVWKPD D ODUJH SRUWRQ R I D V W K P D U R I L F K U Y L Q R Q L Q F O X G H P H O H U D W R B O R I S W K H
FWRNLQH LQ WKHLVX DJHUV D V F R Q @ U L E S X L R Q D U R P L O H W A R D L O G H G Z L W K D V W K
LQ DGGLWLRQ W H R O @ V S I R Y I H Q D C P P D W R R N L Q R Y H F D V H V & 5 S D W K R J H Q H V L V L Q F O X C
, / , / D Q G 7 6 / 3 D Q G O L S L G & \ V / 7 6 P O G S 3 * ' & 5 P I G L D F Z R O L V K D Y H G H R V L Q R S K L O L F

&LWDW&DQDJQHUR . 'RKHUW\ 7\$ &\WRNLQH DQG /LSLG 0HGLDWRU 5HJXODWLRQ RI *UR
\$LUZD\ 'LVHVDH - &\WRNLQH %LRO

3DJH RI

%DQNR*YD/ DL - <RVKLP RWR (%R\FH -\$ \$XV&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
/HXNRWULHQH (HOLFLWV UHVSLUDWRU\ HSDV&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
* SURWHLQ FRXSOHG UHFHSWRU *35 3URFDQDQWJ \$%DQ% R\FH 8\$ \$ /LSLG PHGLDWRU
\$OOHUJ\ \$VWKP D ,PPXQRO
%DUWHPHV .5 ,LMLPD . .RED\DVKL 7 .HSDV&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
 ,/ UHVSQRVLYH OLQHDJH &' &' GLVH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
PHGLDWH LQQDWH WISHLQ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
,PPXQRO
/XQG 6- 3RUWLOOR \$ &DYDJQHUR . %DXP&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
/HXNRWULHQH & 3RWHQWLDWHV ,/ ,QGXFH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
\$FWLYDWR, &DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
;XH/ 6DOLPL 0 3DQVH , 0M,VEHUJ -0 0F.HQJ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
3URVWDJODQGLQ ' DFWLYDWHV JURXS LQQDWH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
FKHPRDWWUDFWDQW UHFHSWRU KRPRORJRXV LQQDWH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
\$OOHUJ\ &OLQ ,PPXQRO
6DOLPL6W,JHU / /LX : *R 6 3DYRUG , HVDQ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
OHXNRWULHQH (DFWLYDWHV KXP DQ JURXS LQQDWH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
HQQDQ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
&OLQ ,PPXQRO 6
<RNRPLR.DWR .+DJL D + ,]XPL 7 6KLPLX&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
+ \GUR\HLFRVDQRLGV ELQGDW&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
UHFHSWRU %/7 - %LRO &KHP
.RQ\ D 9 0M,VEHUJ - /LSLG PHGLDWRUV DV&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
IXQFWLRQ LQ DOOHUJLF GLVH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
&KDQJ -('RKHUW\ %SR&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
UHJXODWHV KXP DQ WISH LQQDWH O\PSKRLG FHOO EKHP&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
,PPXQRO H
%DUQ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
\$ UHJXODWHV QDWXUDO NLOOHU FHOO DQG WISH LQQDWH O\PSKRLG FHOO DFWLYDWR
LQ DVWKP D 6FL 7UDQVO 0HG UD GRPLQDQW PHGLDWRU RI DVSLULQ H[DFHUED
:RMQR ORQWLFHOOL /\$ 7UDQ 69 \$OHQJKDW &O&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
H SURVWDJODQGLQ ' UHFHSWRU &57+ UHJXODWHV DE&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
LQQDWH O\PSKRLG &DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
.LP 6+ .LP <. 3DUN +: -HH <. %DKQ -: HW%&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
EHWZHHQ SRO\PRUSKLV PV LQ SURVWDQRLG UHFHSWRU JHOHV DQJ 55 OYUSK\ .&)H
LQWROHUDQW DVWKP D 3KDUPDFRQHJHW *HQ&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
6FKXOPDQ (6 1HZEDOO ++ 'HPHUV /0)LW]SD&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ
\$QDSK\ODFWLF UHOHDVH RI WKURPER[DQH \$ SURVWDJODQGLQ ' DQG
SURVWDF\FOLQ IURP KXP DQ OXQJ SDUH&DQ&DUMMUD 79 3HHBOUHO516 R-IU SURVWDJ

RSHQ DFFHV V MRXUQDO